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## Hands-on versus hands-off techniques for the prevention of perineal trauma during vaginal delivery: a systematic review and meta-analysis of randomized controlled trials

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### ABSTRACT

**Background:** Perineal trauma at the time of vaginal delivery is common, and when the anal sphincter is included, these injuries can be associated with additional morbidity including incontinence, pelvic pain, and sexual dysfunction.

**Objective:** The aim of this systematic review with meta-analysis was to evaluate whether a hands-on technique during vaginal delivery results in less incidence of perineal trauma than a hands-off technique.

**Methods:** Electronic databases were searched from their inception until June 2018. No restrictions for language or geographic location were applied. The reference lists of identified articles were examined to identify studies not captured by electronic searches. Randomized controlled trials comparing a hands-on technique of perineal support during vaginal delivery (i.e. intervention group) with a hands-off technique (i.e. control group) were included in the meta-analysis. Hands-on was defined as involving one hand on the fetal head, applying pressure to control expulsion, with the other hand applying pressure on the maternal perineum. The primary outcome was severe perineal trauma, defined as either third- or fourth-degree lacerations. The meta-analysis was performed using the random effects model of DerSimonian and Laird, to produce summary treatment effects in terms of relative risk (RR) with 95% confidence interval (CI).

**Results:** Five trials, including 7287 women, were analyzed. All studies included singleton gestations with cephalic presentation at term undergoing spontaneous vaginal delivery. Women randomized to the hands-on technique had similar incidence of severe perineal trauma (1.5 versus 1.3%; RR 2.00, 95% CI 0.56–7.15). There was no significant between-group difference in the incidence of intact perineum, first-, second- and fourth-degree laceration. Hands-on technique was associated with increased risk of third-degree lacerations (2.6 versus 0.7%; RR 3.41, 95% CI 1.39–8.37) and of episiotomy (13.6 versus 9.8%, RR 1.59, 95% CI 1.14–2.22) compared to the hands-off technique.

**Conclusions:** Hands-on technique during spontaneous vaginal delivery of singleton gestations results in similar incidence of several perineal traumas compared to a hands-off technique. The incidence of third-degree lacerations and of episiotomy increases with the hands-on technique.

### KEY MESSAGE

- A hands-on technique during vaginal delivery results in similar incidence of severe lacerations compared to hands-off.

### ARTICLE HISTORY

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### KEYWORDS

Hands-off; hands-on; perineal lacerations; second stage; vaginal delivery

## Introduction

Perineal trauma at the time of vaginal delivery is common, and when the anal sphincter is included, these injuries can be associated with additional morbidity including incontinence, pelvic pain, and sexual dysfunction. The incidence of perineal trauma has been

reported to be up to 85% [1], with the most common being first or second-degree lacerations (perineal skin only, and perineal skin and muscles, respectively). Rates of third-degree lacerations, involving the anal sphincter, and fourth-degree lacerations, involving the sphincter and anal epithelium, vary in reports

secondary to differences in classification and reporting. According to the Nationwide Inpatient Sample, a population-based cohort of over 7 million women who underwent vaginal delivery between 1998 and 2010, the rate of third- and fourth-degree lacerations were 3.3 and 1.1%, respectively [2,3]. A considerable amount of research has been done to evaluate techniques to decrease rates of perineal trauma, but this continues to be an area of debate. Techniques studied include hands-on versus hands-off, perineal massage, warm compresses, Ritgen maneuver, and others [3,4]. It is unclear if a hands-on technique decreases the incidence of perineal trauma compared to a hands-off technique [1,5–9].

The aim of this systematic review and meta-analysis of randomized controlled trials was to evaluate whether a hands-off technique during vaginal delivery decreases the risk of perineal trauma.

## Materials and methods

### Search strategy

This review was performed according to a protocol designed *a priori* and recommended for systematic review [10]. Electronic databases (i.e. Medline, ClinicalTrials.gov, ScienceDirect, the Cochrane Library at the CENTRAL Register of Controlled Trials) were searched from their inception until March 2017. Search terms used were the following text words: “hand on,” “hands-on,” “hand-off,” “hands-off,” “hands-poised,” “vaginal,” “perineal,” “support,” “trauma,” “meta-analysis,” “metaanalysis,” “review,” “randomized,” “clinical trial,” “randomized,” and “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 two authors (RPW, VB). Differences were discussed and consensus reached.

### Study selection

We included all published and unpublished RCTs comparing the use of a hands-on technique during vaginal delivery (i.e. intervention group) with a control group for comparison (i.e. hands-off). Hands-on was defined as involving one hand on the fetal head, applying pressure to control expulsion, with the other hand applying pressure on the maternal perineum (Figure 1). Other perineal techniques (e.g. perineal

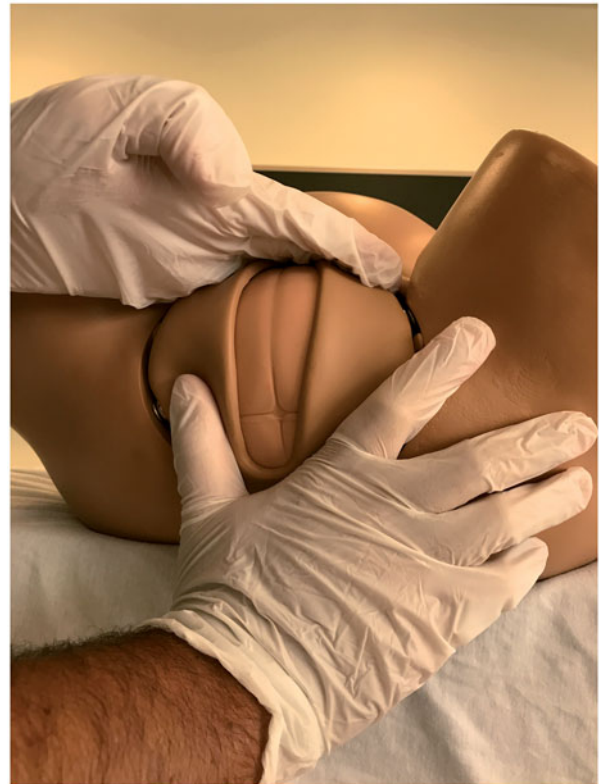


Figure 1. Hands on technique.

massage, warm compresses, Ritgen maneuver), were not included in this meta-analysis. We did include studies in all languages.

### Risk of bias

The risk of bias in each included study was assessed by using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* [10]. 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 authors' judgments were categorized as “low risk,” “high risk,” or “unclear risk” of bias.

Two authors (RPW, VB) independently assessed inclusion criteria, risk of bias and data extraction. Disagreements were resolved by discussion.

### Outcomes

All analyses were done using an intention-to-treat approach, evaluating women according to the

treatment group to which they were randomly allocated in the original trials. Primary and secondary outcomes were defined before data extraction.

The primary outcome was severe perineal trauma, defined as either third- or fourth-degree laceration. The secondary outcomes were intact perineum, defined as no perineal tear of any degree; the incidence of first-, second-, third- and fourth-degree lacerations; and incidence of episiotomy. The first-degree laceration was defined as an injury to perineal skin and/or vaginal mucosa. The second-degree laceration was defined as an injury to perineum involving perineal muscles but not involving the anal sphincter. The third-degree laceration was defined as an injury involving the anal sphincter complex. The fourth-degree laceration was defined as an injury to perineum involving the anal sphincter complex and the anorectal mucosa. Subgroup analysis in nulliparous versus multiparous women, and sensitivity analysis excluding trials with a high risk of bias were planned.

### Data extraction and synthesis

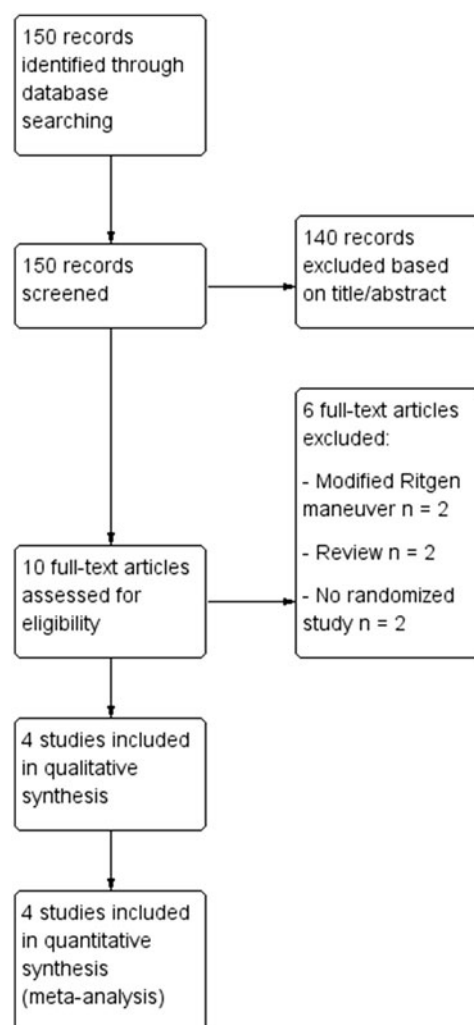
Data from each eligible study were extracted without modification of original data onto custom-made data collection forms. A 2 by two table was assessed for relative risk (RR). The data analysis was completed independently by two authors (RPW, GS) using Review Manager v. 5.3 (The Nordic Cochrane Center, Cochrane Collaboration, 2014, Copenhagen, Denmark). The completed analyses were then compared, and any difference was resolved by discussion. The summary measures were reported as RR with 95% confidence interval (CI) using the random-effects model of DerSimonian and Laird.  $I^2$  (Higgins  $I^2$ ) was used to identify heterogeneity.

The meta-analysis was reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [11]. Before data extraction, the review was registered with the PROSPERO International Prospective Register of Systematic Reviews (registration No: CRD 42 017 072 106).

## Results

### Study selection and study characteristics

The flow of study identification is shown in Figure 2. Five RCTs, including 7287 women, were analyzed [1,5–8]. No additional unpublished data were available from authors.



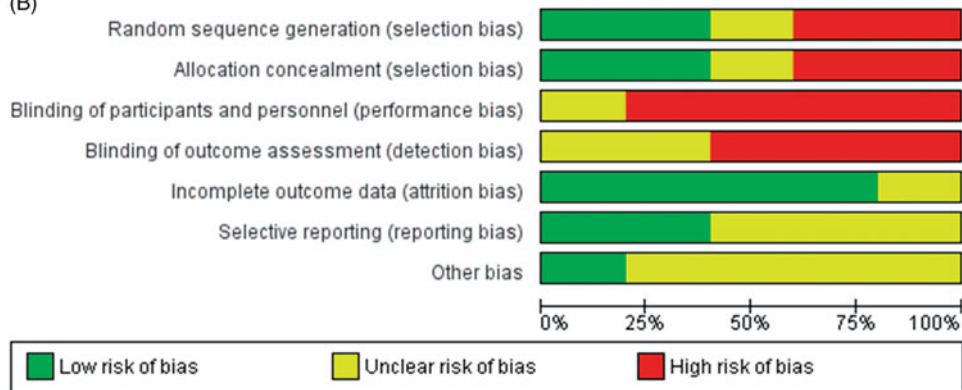
**Figure 2.** Flow diagram of studies identified in the systematic review.

A summary of the methodological quality for each individual study is presented in Figure 3(A), and a summary of methodological quality across all trials in Figure 3(B). Random sequence generation was assessed as “low risk of bias” in only two trials. The other three studies, including Mayerhofer et al., which randomized according to date of birth, were assessed as high risk of bias for sequence generation. Given the nature of the interventions, it was not possible to blind the intervention for the clinician or the midwife performing the technique. It was also impossible to blind the participants to the allocated group and therefore all trials were assessed to be at high risk of performance bias. In McCandlish et al., women were not told which group they ended up in unless the women asked for that information (Figure 3). The statistical heterogeneity between the trials ranged from low to high with  $I^2 = 78\%$  for the primary outcome.

(A)

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Da Costa 2006	?	?	-	-	?	?	?
Kushavar 2009	-	-	?	?	+	+	?
Mayerhofer 2002	-	-	-	-	+	?	+
McCandlish 1998	+	+	-	?	+	+	?
Rozita 2014	+	+	-	-	+	?	?

(B)



**Figure 3.** 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.

Table 1 and Table 2 show the characteristics of the included trials. Out of the 7287 women included in the trial, 3675 were randomized into the hands-on group (i.e. intervention group), and 3612 were randomized into the hands-off group (i.e. comparison group). All studies included only singleton gestations with a cephalic presentation at term undergoing spontaneous vaginal delivery and excluded multiple gestations, preterm delivery, and operative vaginal delivery. Three trials included only nulliparous women. The hands-on technique in the intervention group was

described mostly as pressure by one hand of the provider on the fetal head to increase flexion, while the other hand of the provider supports the maternal perineum. The control group was described as no touching of the fetal head and of the maternal perineum.

### Synthesis of results

Women randomized to the hands-on technique had a similar incidence of severe perineal trauma (1.5 versus 1.3%; RR 2.00, 95% CI 0.56–7.15; Figure 4). There was

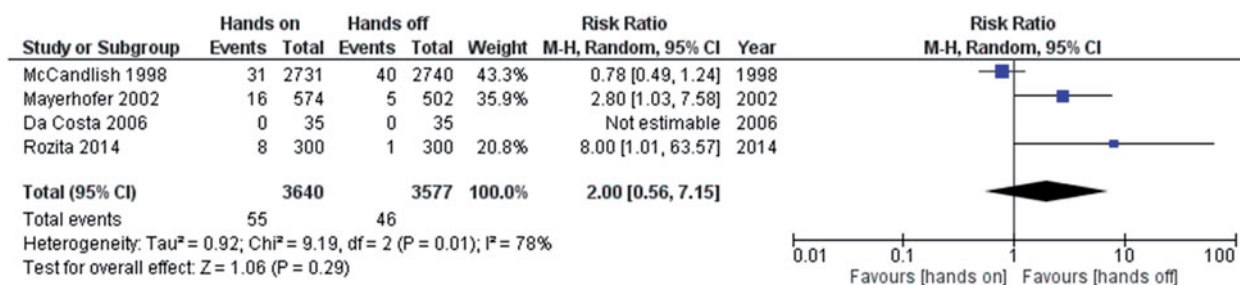
**Table 1.** Characteristics of the included studies.

Study	Location	Number of subjects <sup>a</sup>	Intervention	Timing and frequency of hands-on intervention	Control
McCandlish 19981	UK	5471 (2731 versus 2740)	Hands are used for pressure on the head to increase flexion, and to support the perineum. Lateral flexion is used for delivery of the shoulders. The left hand applies pressure on the infant's head to increase flexion. The right hand is placed on perineum for support and lateral flexion to facilitate delivery of shoulders.	93% in each group were randomized in the second stage, about 8–9 minutes before delivery; Frequency not reported During second stage; Frequency not reported	No touching of the head and of the perineum. Spontaneous delivery of shoulders.
Mayerhofer 20025	Austria	1076 (574 versus 502)	Left hand on the occiput with the palm toward the anterior region, to control expulsion. Right hand- 'U' shape on index finger and thumb to apply pressure to posterior perineum, leaving all areas protected. The left hand supports the infant's head during shoulder delivery, and allows external rotation. If delivery does not occur, the continue with posterior perineal pressure, and with the left hand, pull downward to deliver the anterior shoulder. To deliver the posterior shoulder, traction is then upward. Then, support the infant's neck with one hand, and the remainder of the body with the other.	"At crowning"; Frequency not reported	No touching of the head and of the perineum. Delivery of shoulders is supported by both hands.
Da Costa 20066	Brazil	70 (35 versus 35)	The right hand maintains flexion of occiput, and the left provides hand pressure on perineum.		During expulsion, conduct is expectant (observe restitution, external rotation, delivery of shoulders, remainder of body). During delivery, support the baby's head with one hand and torso with the other. If external rotation or delivery does not occur spontaneously within 15 seconds of head delivery, or if newborn appears hypoxic, the provider manually rotates the head and applies gentle downward traction. After delivery of the anterior, gentle upward traction delivers the posterior shoulder. The neck is held with one hand, the other hand follows along the infant's back, the legs or feet are grasped to complete delivery.
Kushavar 20098	Iran	70 (35 versus 35)	The right hand maintains flexion of occiput, and the left provides hand pressure on perineum.	Randomization at the end of the second stage	Observe restitution, external rotation, delivery of shoulders, remainder of body. Rotate head and help delivery if this does not occur spontaneously after delivery of head, or the newborn appears hypoxic
Rozita 20147	Iran	600 (300 versus 300)	The right hand maintains flexion of occiput, and the left provides hand pressure on perineum.	"At the end of the second stage";	Observe restitution, external rotation, delivery of shoulders, remainder of body. Rotate head and help delivery if this does not occur spontaneously after delivery of head, or the newborn appears hypoxic

<sup>a</sup>Total number (number in the intervention versus number in the control group).

**Table 2.** Inclusion and exclusion criteria of the included trials.

Study	Inclusion criteria	Nulliparous	Exclusion criteria
McCandlish 1998 [1]	Singleton gestations, cephalic presentation	36.5 versus 38.4%	Planned water birth, episiotomy prescribed, planned operative vaginal delivery, planned cesarean section, multiple gestations, stillbirth, preterm (< 37 weeks), not recruited antenatally, maternal refusal
Mayerhofer 2002 [5]	Singleton gestations, cephalic presentation at term	Not reported	Multiple gestations, malpresentation, operative vaginal delivery, preterm delivery
Da Costa 2006 [6]	Cephalic presentation, full term, nulliparous, uterine height $\leq$ 36 cm, cervical dilation $\leq$ 8 cm, intact membranes	100 versus 100%	Malpresentation, preterm delivery, oxytocin use in 1st or 2nd stage, perineal preparation during pregnancy, labor exceeding 12 hours after hospital admission, episiotomy, labor abnormalities related to fetal distress, delivery in lithotomy, cesarean delivery indicated
Kushavar 2009 [12]	Singleton gestations, cephalic presentation at term, nulliparous	100 versus 100%	Multiple gestations, malpresentation, operative vaginal delivery, perineal preparation during pregnancy, preterm delivery
Rozita 2014 [7]	Singleton gestations, cephalic presentation at term, nulliparous	100 versus 100%	Multiple gestations, malpresentation, operative vaginal delivery, oxytocin use in 1st or 2nd stage, perineal preparation during pregnancy, preterm delivery

**Figure 4.** Forest plot for the risk of severe perineal trauma.

no significant between-group difference in the incidence of an intact perineum, first-, second- and fourth-degree laceration. The hands-on technique was associated with increased risk of third-degree laceration (2.6 versus 0.7%; RR 3.41, 95% CI 1.93–8.37) and of episiotomy (13.6 versus 9.8%, RR 1.59, 95% CI 1.14–2.22) compared to the hands-off technique (Table 3).

Given the lack of data, planned subgroup, and sensitivity analyses could not be performed.

## Discussion

### Main findings

This meta-analysis from five RCTs, including 7287 women, showed that hands-on technique during labor was not only associated with a similar incidence of severe perineal trauma, defined as third- and fourth-degree lacerations, but a higher incidence of third-degree lacerations and of episiotomy. Only one RCT reported fourth-degree lacerations separately. The hands-on technique is mostly described as one hand

of the delivering provider over the delivering fetal head to keep it flexed, and the other provider hand supporting the perineum. These findings are limited by the low quality of evidence and by the low quality of the included trials.

### Comparison with existing literature

Our results are mostly consistent with a recent Cochrane Review by Aasheim et al. [3], and with a previous review and meta-analysis by Bulchandani [9]. These reviews did not show a beneficial effect of the “hands-on” over “hands-off” techniques in regard to perineal trauma. Consistent with our review, Aasheim et al. [3] and Bulchandani [9] showed a higher rate of episiotomy with the hands-on technique. However, these reviews also included other perineal techniques, including Ritgen maneuver, in which the fetal chin is reached for between the anus and coccyx, and pulled anteriorly [12,13]. The Aasheim et al. most recent meta-analysis by the Cochrane Library [3] includes other perineal techniques used in the second stage aimed to decrease lacerations, including not only the

**Table 3.** Primary and secondary maternal outcomes.

	McCandlish 1998 [1]	Mayerhofer 2002 [5]	Da Costa 2006 [6]	Kushavar 2009 [12]	Rozita 2014 [7]	Total	RR (95% CI)	I <sup>2</sup>
Severe perineal trauma <sup>a</sup>	31/2731 versus 40/2740	16/574 versus 5/502	0/35 versus 0/35	Not reported	8/300 versus 1/300	55/3640 (1.5%) versus 46/3577 (1.3%)	2.00 (0.56–7.15)	78%
Intact perineum	885/2731 versus 887/2740	284/574 versus 271/502	7/35 versus 6/35	14/35 versus 17/35	185/300 versus 204/300	1375/3675 (37.4%) versus 1385/3612 (38.3%)	0.96 (0.91–1.01)	0%
Intact perineum, excluding episiotomy	1236/2731 versus 1167/2740	387/574 versus 322/502	Not reported	Not reported	223/300 versus 221/300	1846/3605 (51.2%) versus 1710/3542 (48.3%)	1.05 (1.0–1.09)	0%
First-degree laceration	813/2731 versus 802/2740	96/574 versus 98/502	23/35 versus 24/35	Not reported	52/300 versus 66/300	984/3640 (27%) versus 990/3577 (27.7%)	0.96 (0.87–1.07)	16%
Second-degree laceration	1002/2731 versus 1011/2740	75/574 versus 77/502	5/35 versus 5/35	Not reported	17/300 versus 12/300	1099/3640 (30.2%) versus 1105/3577 (30.9%)	0.99 (0.93–1.06)	0%
First & Second – degree laceration	1815/2731 versus 1813/2740	171/574 versus 175/502	28/35 versus 29/35	15/35 versus 14/35	69/300 versus 78/300	2098/3675 (57.1%) versus 2109/3612 (58.4%)	0.99 (0.94–1.04)	5%
Third- degree laceration	Not reported	16/574 versus 5/502	0/35 versus 0/35	Not reported	8/300 versus 1/300	24/909 (2.6%) versus 6/837 (0.7%)	3.41 (1.39–8.37)	0%
Fourth- degree laceration	Not reported	Not reported	0/35 versus 0/35	Not reported	Not reported	0/35 versus 0/35	N/A	N/A
Major perineal trauma <sup>b</sup>	1033/2731 versus 1051/2740	194/574 versus 133/502	5/35 versus 5/35	Not reported	63/300 versus 30/300	1295/3640 (35.6%) versus 1219/3577 (34.1%)	1.28 (0.94–1.74)	84%
Episiotomy	351/2731 versus 280/2740	103/574 versus 51/502	Not reported	Not reported	38/300 versus 17/300	492/3605 (13.6%) versus 348/3542 (9.8%)	1.59 (1.14–2.22)	71%

<sup>a</sup>Defined as Third- or Fourth-degree laceration. <sup>b</sup>Defined as Second-, Third-, or Fourth-degree laceration, episiotomy. Data are presented as total number (number in the intervention versus number in control group). RR: relative risk; CI: confidence interval; N/A: not applicable. Boldface data, statistically significant.

hands-on technique, but also warm compresses, perineal massage, and the Ritgen maneuver.

### Strengths and weaknesses

Strengths of this study include the fact that this is the most comprehensive meta-analysis on the hands-on technique thus far, as it adds to the latest 2017 Cochrane meta-analysis, as described above. This is the only meta-analysis that focuses only on the hands-on technique, without confounding results with other second stage techniques to protect the perineum such as massage, warm compresses, or Ritgen maneuver. Weaknesses include the weaknesses of the included studies. For example, the intervention (hands-on) could not be blinded. Some studies have reported that a bias towards one technique by the delivering provider (e.g. the midwife thought before the study that the hands-on method would be superior) may be associated with an effect on the incidence of perineal trauma [1,6]. As most delivering providers were biased that the hands-on technique was superior before starting the study, the hands-off technique may be even safer than reported, compared to the hands-on technique [1,6].

Many other variables may influence the incidence of perineal lacerations. These include in particular the other cited second stage techniques of perineal massage, use of oils, warm compresses, Ritgen maneuver, and a perineal protective device [4]. Use of perineal massage and warm compresses in the second stage have been associated with the prevention of perineal trauma [4], while the use of oils, Ritgen maneuver, and the protective device has either been limited or not shown to be beneficial [4]. None of these techniques were used in the studies included in our meta-analysis. Use of episiotomy should be avoided, or at least very limited. The use of episiotomy was 11.8% overall in our meta-analysis. Unfortunately, an analysis excluding episiotomy was not feasible.

Some maternal characteristics have been shown to be risk factors for perineal lacerations, such as nulliparity and Asian ethnicity [3]. Antenatal perineal massage reduces the incidence of perineal lacerations requiring suturing [14]. Some labor characteristics that have been associated with an effect of the incidence of perineal lacerations are labor induction or augmentation and use of oxytocin, fetal head position (higher incidence with occiput posterior), birth weight, and operative delivery [4]. Variables that seem not to influence the incidence of perineal lacerations include, but are not limited to, midwife-led care, place of birth,



immersion in water, maternal position in the second stage, spontaneous versus directed pushing, and delayed versus immediate pushing.

### Implications

Different strategies have been adopted in the late first and/or second stage of labor to decrease the incidence of perineal lacerations. These strategies include not only the hands-on technique but also warm compresses, perineal massage, the use of oil or jelly, the Ritgen maneuver and a new perineal protection device [3,4,15–18]. The review by Aasheim reported a decreased risk of third- and fourth-degree lacerations in the perineal massage group (two studies, RR 0.52, 95% CI 0.29–0.94) [4]. This review also showed a similar reduction in third- and fourth-degree lacerations with warm compresses (two studies, RR 0.48, 95% CI 0.28–0.84), but no significant changes with the use of a Ritgen maneuver [4]. Additional reviews have evaluated delayed versus immediate pushing, with no significant difference in perineal trauma [16].

Regarding how the interventions may work, initially, the hands-on technique was hypothesized to control the velocity of the crowning process and therefore decrease perineal trauma [6]. Given the fact that the hands-on approach has been found to be possibly associated with more perineal lacerations instead of less, some have proposed that the harm may be caused by the hands-on approach's additional pressure resulting in some perineal ischemia [5]. Moreover, using one intervention (e.g. hands-on) may predispose to use other interventions (e.g. episiotomy), which have themselves been proven to increase perineal trauma [5].

Perhaps a combination of perineal interventions, such as massage or compresses, with a hands-off approach and avoidance of episiotomy, will prove to show improved perineal outcomes. Larger studies, including evaluation specific for nulliparous subjects, are required to make definitive recommendations for management.

### Conclusions

In summary, hands-on technique during spontaneous vaginal delivery of singleton gestations results in a similar incidence of several perineal trauma compared to the incidence with the hands-off technique. The incidence of third-degree lacerations and of episiotomy is increased with the hands-on technique. Given

no benefit, and potential harm, associated with the hands-on technique, we suggest caution in its use.

### Disclosure statement

No potential conflict of interest was reported by the authors.

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