Perineal techniques during the second stage of labour for reducing perineal trauma (Review)

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[Intervention Review]

Perineal techniques during the second stage of labour for reducing perineal trauma

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ABSTRACT

Background

Most vaginal births are associated with some form of trauma to the genital tract. The morbidity associated with perineal trauma is significant, especially when it comes to third- and fourth-degree tears. Different perineal techniques and interventions are being used to prevent perineal trauma. These interventions include perineal massage, warm compresses and perineal management techniques.

Objectives

The objective of this review was to assess the effect of perineal techniques during the second stage of labour on the incidence of perineal trauma.

Search methods

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (20 May 2011), the Cochrane Central Register of ControlledTrials (*The Cochrane Library* 2011, Issue 2 of 4), MEDLINE (January 1966 to 20 May 2011) and CINAHL (January 1983 to 20 May 2011).

Selection criteria

Published and unpublished randomised and quasi-randomised controlled trials evaluating any described perineal techniques during the second stage.

Data collection and analysis

Three review authors independently assessed trails for inclusion, extracted data and evaluated methodological quality. Data were checked for accuracy.

Main results

We included eight trials involving 11,651 randomised women. There was a significant effect of warm compresses on reduction of third- and fourth-degree tears (risk ratio (RR) 0.48, 95% confidence interval (CI) 0.28 to 0.84 (two studies, 1525 women)). There was also a significant effect towards favouring massage versus hands off to reduce third- and fourth-degree tears (RR 0.52, 95% CI 0.29 to 0.94 (two studies, 2147 women)). Hands off (or poised) versus hand on showed no effect on third- and fourth-degree tears, but we observed a significant effect of hands off on reduced rate of episiotomy (RR 0.69, 95% CI 0.50 to 0.96 (two studies, 6547 women)).

Authors' conclusions

The use of warm compresses on the perineum is associated with a decreased occurrence of perineal trauma. The procedure has shown to be acceptable to women and midwives. This procedure may therefore be offered to women.

PLAIN LANGUAGE SUMMARY

Perineal techniques during the second stage of labour for reducing perineal trauma

Vaginal births are often associated with some form of trauma to the genital tract, which can sometimes be associated with significant short- and long-term problems for the woman. It is especially the third- and fourth-degree tears, that affect the anal sphincter or mucosa, which can cause the most problems. Perineal trauma can occur spontaneously or result from a surgical incision of the perineum, called episiotomy. Different perineal techniques and interventions are being used to slow down the birth, and allow the perineum to stretch slowly to prevent perineal injury. Perineal massage, warm compresses and different perineal management techniques are widely used by midwives and birth attendants. The objective of this review was to assess the effect of perineal techniques during the second stage of labour on the incidence of perineal trauma. We included eight randomised trials (involving 11,651 women) conducted in hospital settings in six countries. The participants in the included studies were women with no medical complications who were expecting a vaginal birth. We conclude that there is sufficient evidence to support the use of warm compresses to prevent perineal tears. The procedure has been shown to be acceptable to both women and midwives. From the meta-analyses we found significant effect of the use of warm compresses compared with hands off or no warm compress on the incidence of third- and fourth-degree tears. We also found a reduction in third- and fourth-degree tears with massage of the perineum versus hands off; and of 'hands off' the perineum versus 'hands on' to reduce the rate of episiotomy. The studies in our systematic review have considerable clinical variation and the terms 'hands on', 'hands off', 'standard care' and 'perineal support' can mean different things and are not always defined sufficiently. The methodological quality of the included studied also varied.

The question of how to prevent the tears is complicated and involves many other factors in addition to the perineal techniques that are evaluated here, e.g. birth position, women's tissue, speed of birth. More research is necessary in this field, to evaluate perineal techniques and also to answer the questions of determinants of perineal trauma.

BACKGROUND

Most vaginal births are associated with some form of trauma to the genital tract (Albers 2003). Anterior perineal trauma is injury to the labia, anterior vagina, urethra, or clitoris and is usually associated with little morbidity. Posterior perineal trauma is any injury to the posterior vagina wall, perineal muscles or anal sphincter (Fernando 2007; Kettle 2008). Spontaneous tears are defined as first degree when they involve the perineal skin only; second-degree tears involve the perineal muscles and skin; third-degree tears involve the anal sphincter complex (classified as 3a where less than 50% of the external anal sphincter is torn; 3b where more than 50% of the external anal sphincter is torn; 3c where the internal and external anal sphincter is torn); fourth-degree tears involve the anal sphincter complex and anal epithelium (Fernando 2007; Kettle 2008). Perineal trauma can occur spontaneously or result from a surgical incision of the perineum, called episiotomy. The incidence of some form of perineal trauma is reported to be 85% (McCandlish 1998) and the incidence of trauma that affect the anal sphincter is reported to be from 0.5% to 7.0% (Sultan 1999) and usually between 0.5% and 2.5% of spontaneous vaginal deliveries (Byrd 2005). There is considerable variation in the number of reported rates of perineal trauma between countries, partly due to differences in definitions and reporting practices (Byrd 2005). Studies show that the extent of perineal trauma often is underestimated (Andrews 2006; Groom 2002). Studies with restrictive use of episiotomy report rates of perineal trauma that require suturing between 44% and 79% (Dahlen 2007; Soong 2005). Higher rates are consistently noted in first vaginal births and with instrumental delivery (Christianson 2003).

Morbidity associated with perineal trauma

Perineal trauma is associated with significant short- and long-term morbidity. Perineal pain is reported to be most severe in the immediate postnatal period (Macarthur 2004). However, discomfort

continues for up to two weeks postpartum in about 30% of women and 7% report pain at three months (McCandlish 1998). Women who sustain obstetric anal sphincter injury are shown to report more pain seven weeks after delivery than those with lesser degree of perineal trauma (Andrews 2007). Women giving birth with an intact perineum, however, report pain less frequently at one, seven and 45 days postpartum (Macarthur 2004). Perineal pain can be intense and often requires pain relief (Andrews 2007; Hedayati 2003). Maternal morbidity associated with perineal trauma also includes dyspareunia (Barrett 2000) and fecal incontinence (Sultan 2002) and can lead to major physical problems, psychological and social problems, and also affect the woman's ability to care for her new baby and cope with the daily tasks of motherhood (Sleep 1991). Urinary problems following childbirth have also been reported to be more prevalent in association with perineal trauma (Boyles 2009). Anal sphincter injury can also be occult or wrongly classified as a minor degree of perineal tear (Andrews 2006). Women with an intact perineum are more likely to resume intercourse earlier, report less pain with first and subsequent sexual intercourse, report greater satisfaction with sexual experience and report greater sexual sensation and likelihood of orgasm at six months postpartum (Radestad 2008; Williams 2007).

Generally, the degree of morbidity is directly related to the degree of the perineal injury sustained, i.e. first- and second-degree perineal trauma causing less severe morbidity than third- and fourth-degree tears (Radestad 2008; Williams 2007). Anal sphincter or mucosal injuries are identified following 3% to 5% of all vaginal births (Ekeus 2008). Around 8% of women experience incontinence of stool and 45% suffer involuntary escape of flatus following anal sphincter injury (Eason 2002). The type of suture material used (Kettle 2002), skills of the operator and technique of suturing influence morbidity experienced by women (Fernando 2006; Sultan 2002).

Factors associated with perineal trauma

Numerous factors have been suggested as potential determinants of perineal trauma. Some determinants of perineal trauma appear to be present before pregnancy and may be intrinsic to the pregnant woman (Klein 1997). It is uncertain which role demographic factors and nutrition in the years before and during pregnancy play in the occurrence of perineal trauma (Klein 1997). Nulliparity, a large baby (both weight and head circumference), a prolonged second stage and malposition increase the risk for perineal trauma (Andrews 2006; Fitzpatrick 2001; Mayerhofer 2002; Soong 2005). Ethnicity is a factor that may affect perineal trauma and association has been found between Asian ethnicity and severe perineal trauma (Dahlen 2007b; Goldberg 2003). Restrictive use of episiotomy is associated with less perineal trauma (Carroli 2010), as is the use of vacuum extraction for instrumental delivery as opposed to forceps (Fitzpatrick 2003). Antenatal digital perineal massage from approximately 35 weeks' gestation reduces the incidence of perineal trauma requiring suturing (Beckmann 2006). Maternal upright position in the second stage of labour for women without epidural anaesthesia results in a considerable reduction in episiotomy usage which is only partly offset by an increase in second-degree tears (Gupta 2004). Physical inactivity before pregnancy may represent an independent risk factor for third- and fourth-degree tears (Voldner 2009). Giving birth in alternative birth settings and planned home birth have been shown to be associated with a reduced prevalence of episiotomy (Hodnett 2010; Radestad 2008), so has also midwifery model of care (Hatem 2008). Planned home birth has also been shown to be associated with a lower prevalence of sphincter rupture (Radestad 2008).

Retrospective studies on water birth report fewer episiotomies, an overall decrease in perineal trauma and no significant difference in third- and fourth-degree tears (Bodner 2002; Otigbah 2000) and an observational study found fewer episiotomies as well as third- and fourth-degree tears in the water birth group (Geissbuehler 2004). Trauma to the birth genital tract does not seem affected by active directed pushing versus spontaneous pushing (Bloom 2006; Schaffer 2005). Retrospective studies on the occurrence of perineal trauma suggest an association between augmentation of labour (Jandèr 2001), accoucheur type (Bodner-Adler 2004) and perineal trauma. A recent randomised controlled study suggests that the intermittent intravaginal use of a specially designed obstetric gel during the first stage of labour increases the rate of intact perineum in nulliparous women (Schaub 2008).

Perineal techniques and other interventions during the second stage for reducing perineal trauma

Awareness of morbidity following perineal trauma has led to the search of different interventions to be used during the second stage to reduce perineal trauma. These interventions include the use of perineal massage, warm compresses and perineal management techniques (Albers 2005; Dahlen 2007; Myrfield 1997; Pirhonen 1998; Stamp 2001). Perineal management techniques termed as guiding or support techniques are believed to reduce perineal trauma (Myrfield 1997; Pirhonen 1998). A wide variety of techniques are practiced, among them the flexion technique and Ritgen's manoeuvre. Each technique claims to reduce perineal trauma by reducing the presenting diameter of the fetal head through the woman's vaginal opening (Myrfield 1997). The flexion technique involves the maintenance of flexion of the emerging fetal head, by exerting pressure on the emerging occiput in a downwards direction towards the perineum, preventing extension until crowning; and the guarding of the perineum by placing a hand against the perineum to support this structure (Mayerhofer 2002; Myrfield 1997). In Ritgen maneuver the fetal chin is reached for between the anus and coccyx and pulled interiorly, while using the fingers of the other hand on the fetal occiput to control speed of delivery

and keep flexion of the fetal head (Cunningham 2005; Jönsson 2008).The Ritgen maneuver is called modified (Jönsson 2008) when performed during a contraction, rather than between contractions as originally recommended (Cunningham 2008).

Support techniques slow down the birth of the head, allowing the perineum to stretch slowly, thus reducing perineal trauma (Downe 2003). This is why birth attendants, together with the use of support techniques, commonly ask women to breathe instead of push as the head is delivered. The delivery of the infant's shoulders is usually assisted by downward traction first, to free the anterior shoulder, and subsequently the posterior shoulder is delivered by guiding the baby in an upward curve (Downe 2003).

No systematic reviews have been published comparing different perineal support and other techniques used during the second stage of labour for reducing perineal trauma. It has, however, been suggested that both the flexion and Ritgen maneuver act against the normal mechanism of labour in which the baby naturally angles itself in the most appropriate attitude to pass through the birth canal (Myrfield 1997). This poses the question of which support and other perineal techniques that are beneficial for preventing perineal trauma.

OBJECTIVES

The objective of this review was to assess the effect of perineal techniques during the second stage of labour on the incidence and morbidity associated with perineal trauma.

METHODS

Criteria for considering studies for this review

Types of studies

We included all published and unpublished randomised and quasi-randomised controlled trials (RCTs) evaluating any described perineal techniques during the second stage.

Types of participants

Pregnant women planning to have a spontaneous vaginal birth (after 36 weeks of pregnancy, pregnant with single fetus, cephalic presentation).

Types of interventions

Any perineal techniques for example: perineal massage, flexion technique, Ritgen's manoeuvre, warm compresses, hands-on or hands-poised, etc., all performed during the second stage of labour.

Types of outcome measures

Primary outcomes

- Intact perineum
- Perineal trauma not requiring suturing
- Perineal trauma requiring suturing
- First-degree perineal tear
- Second-degree perineal tear
- Third-degree perineal tear
- Fourth-degree perineal tear
- Incidence of episiotomy

Secondary outcomes

- Length of second stage
- For the newborn: Apgar less than seven at five minutes
- Admission to special care baby unit
- Perineal pain postpartum
- Perineal pain at three and at six months after birth
- Breastfeeding: initiation
- Breastfeeding: at three months and at six months after birth
- Women's satisfaction
- Morbidity after birth related to sexual health (i.e. stress incontinence and dyspareunia)

Search methods for identification of studies

Electronic searches

We contacted the Trials Search Co-ordinator to search the Cochrane Pregnancy and Childbirth Group's Trials Register (20 May 2011).

The Cochrane Pregnancy and Childbirth Group's Trials Register is maintained by the Trials Search Co-ordinator and contains trials identified from:

1. quarterly searches of the Cochrane Central Register of Controlled Trials (CENTRAL);
2. monthly searches of MEDLINE;
3. weekly searches of EMBASE;
4. handsearches of 30 journals and the proceedings of major conferences;
5. weekly current awareness search of a further 37 journals.

Details of the search strategies for CENTRAL, MEDLINE and EMBASE, the list of handsearched journals and conference proceedings, and the list of journals reviewed via the current awareness service can be found in the 'Search strategies for identification of studies' section within the editorial information about the Cochrane Pregnancy and Childbirth Group.

Trials identified through the searching activities described above are given a code (or codes) depending on the topic. The codes are linked to review topics. The Trials Search Co-ordinator searches the register for each review using these codes rather than keywords.

In addition, we searched (CENTRAL) (*The Cochrane Library* 2011, Issue 2 of 4) using the search strategy in Appendix 1, MEDLINE (January 1966 to May 2011) using the search strategy in Appendix 2 and CINAHL (January 1983 to May 2011) using the search strategy in Appendix 3.

We did not apply any language restrictions.

Data collection and analysis

Selection of studies

We considered for inclusion all potential studies we identified as a result of the search strategy. Three review authors, V Aasheim (VAA), ABV Nilsen (ABVN), and M Lukasse (ML) examined the abstracts of studies identified by the search strategy. All three authors examined all the abstracts independently. We then retrieved full publications for qualifying abstracts. We resolved discrepancies by discussion and by seeking the opinion of the fourth author, LM Reinar (LMR). We kept a log of excluded studies, with reasons for exclusions.

Data extraction and management

We designed a form to extract data. For eligible studies, three review authors (VAA, ABVN, ML) extracted the data using the agreed form. We resolved discrepancies through discussion. Three authors (VAA, ABVN, ML) independently entered data on an extracting form. We discussed discrepancies with the fourth author (LMR) and resolved by consensus. One author (VAA) entered data into Review Manager software (RevMan 2011), and the others checked data entry. The review authors were not blinded to the names of authors, journals or institutions.

When information regarding any of the above was unclear, we contacted authors of the original reports to provide further details.

Assessment of risk of bias in included studies

Three review authors (VAA, ABVN, ML) independently assessed risk of bias for each study using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We resolved any disagreement by discussion with the fourth author (LMR).

(1) Sequence generation (checking for possible selection bias)

We described for each included study the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.

We assessed the method as:

- low risk of bias (any truly random process, e.g. random number table; computer random number generator);
- high risk of bias (any non-random process, e.g. odd or even date of birth; hospital or clinic record number); or
- unclear risk of bias.

(2) Allocation concealment (checking for possible selection bias)

We described for each included study the method used to conceal the allocation sequence and determine whether intervention allocation could have been foreseen in advance of, or during recruitment, or changed after assignment.

We assessed the methods as:

- low risk of bias (e.g. telephone or central randomisation; consecutively numbered sealed opaque envelopes);
- high risk of bias (open random allocation; unsealed or non-opaque envelopes, alternation; date of birth);
- unclear risk of bias.

(3) Blinding (checking for possible performance bias)

We described for each included study the methods used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. We considered that studies are at low risk of bias if they were blinded, or if we judged that the lack of blinding could not have affected the results. We assessed blinding separately for different outcomes or classes of outcomes.

We assessed the methods as:

- low, high or unclear risk of bias for participants;
- low, high or unclear risk of bias for personnel;
- low, high or unclear risk of bias for outcome assessors.

(4) Incomplete outcome data (checking for possible attrition bias through withdrawals, dropouts, protocol deviations)

We described for each included study, and for each outcome or class of outcomes, the completeness of data including attrition and exclusions from the analysis. We state whether attrition and exclusions were reported, the numbers included in the analysis at each stage (compared with the total randomised participants), reasons for attrition or exclusion where reported, and whether missing data were balanced across groups or were related to outcomes. Where

sufficient information was reported, or could be supplied by the trial authors, we re-included missing data in the analyses which we undertook. We assessed methods as:

- low risk of bias (e.g. no missing outcome data; missing outcome data balanced across groups);
- high risk of bias (e.g. numbers or reasons for missing data imbalanced across groups; 'as treated' analysis done with substantial departure of intervention received from that assigned at randomisation);
- unclear risk of bias

(5) Selective reporting bias

We described for each included study how we investigated the possibility of selective outcome reporting bias and what we found. We assessed the methods as:

- low risk of bias (where it is clear that all of the study's pre-specified outcomes and all expected outcomes of interest to the review have been reported);
- high risk of bias (where not all the study's pre-specified outcomes have been reported; one or more reported primary outcomes were not pre-specified; outcomes of interest are reported incompletely and so cannot be used; study fails to include results of a key outcome that would have been expected to have been reported);
- unclear risk of bias.

(6) Other sources of bias

We described for each included study any important concerns we have about other possible sources of bias.

We assessed whether each study was free of other problems that could put it at risk of bias:

- low risk of other bias;
- high risk of other bias;
- unclear whether there is risk of other bias.

(7) Overall risk of bias

We made explicit judgements about whether studies are at high risk of bias, according to the criteria given in the *Handbook* (Higgins 2011). With reference to (1) to (6) above, we assessed the likely magnitude and direction of the bias and whether we consider it likely to impact on the findings. In future updates of the review, we will explore the impact of the level of bias through undertaking sensitivity analyses - *see* Sensitivity analysis.

Measures of treatment effect

Dichotomous data

For dichotomous data, we present results as summary risk ratio with 95% confidence intervals.

Continuous data

For continuous data, we will in future updates use the mean difference if outcomes are measured in the same way between trials. We will use the standardised mean difference to combine trials that measure the same outcome, but use different methods.

Unit of analysis issues

Cluster-randomised trials

We did not identify any cluster-randomised trials for inclusion in this review. In future updates, if we identify any cluster-randomised trials for inclusion, we will include them in the analyses along with individually randomised trials. We will adjust their standard errors using the methods described in the *Handbook* (Higgins 2011), using an estimate of the intra cluster correlation co-efficient (ICC) derived from the trial (if possible), from a similar trial or from a study of a similar population. If we use ICCs from other sources, we will report this and conduct sensitivity analyses to investigate the effect of variation in the ICC. If we identify both cluster-randomised trials and individually-randomised trials, we plan to synthesise the relevant information. We will consider it reasonable to combine the results from both if there is little heterogeneity between the study designs and the interaction between the effect of intervention and the choice of randomisation unit is considered to be unlikely.

We will also acknowledge heterogeneity in the randomisation unit and perform a sensitivity analysis to investigate the effects of the randomisation unit.

Dealing with missing data

For all outcomes, we carried out analyses, as far as possible, on an intention-to-treat basis, i.e. we attempted to include all participants randomised to each group in the analyses, and all participants were analysed in the group to which they were allocated, regardless of whether or not they received the allocated intervention. The denominator for each outcome in each trial was the number randomised minus any participants whose outcomes are known to be missing.

Assessment of heterogeneity

We assessed statistical heterogeneity in each meta-analysis using the T^2, I^2 and Chi^2 statistics. We regarded heterogeneity as substantial if T^2 was greater than zero and either I^2 was greater than 30% or there was a low P value (less than 0.10) in the Chi^2 test for heterogeneity.

Assessment of reporting biases

When there are, in future reviews, 10 or more studies in the meta-analysis we will investigate reporting biases (such as publication bias) using funnel plots. We will assess funnel plot asymmetry visually, and use formal tests for funnel plot asymmetry. For continuous outcomes we will use the test proposed by Egger 1997, and for dichotomous outcomes we will use the test proposed by Harbord 2006. If we detect asymmetry in any of these tests or by a visual assessment, we will perform exploratory analyses to investigate it.

Data synthesis

We carried out statistical analysis using the Review Manager software (RevMan 2011). Because there was clinical heterogeneity sufficient to expect that the underlying treatment effects differed between trials, and substantial statistical heterogeneity was detected, we used random-effects meta-analysis to produce an overall summary where an average treatment effect across trials was considered clinically meaningful. We treated the random-effects summary as the average range of possible treatment effects and we discussed the clinical implications of treatment effects differing between trials. If the average treatment effect was not clinically meaningful we did not combine trials.

Where we use random-effects analyses, we have presented the results as the average treatment effect with its 95% confidence interval, and the estimates of T^2 and I^2.

Subgroup analysis and investigation of heterogeneity

If we, in future reviews, identify substantial heterogeneity, we will investigate it using subgroup analyses and sensitivity analyses. We will consider whether an overall summary is meaningful, and if it is, use random-effects analysis to produce it.

There were insufficient data to carry out our prespecified subgroup analyses. However, in future updates of this review, as more data become available, we will carry out the following subgroup analyses.

- Nullipara versus multipara.
- Birthweight: less than 4000 g versus 4000 g or more.
- Maternal age: less than 35 years versus 35 years or more.
- Ethnicity: women from one ethnic group versus women from another ethnic group.

We will use the following outcomes in subgroup analysis.

- Intact perineum
- Perineal trauma not requiring suturing
- Perineal trauma requiring suturing
- First-degree perineal tear
- Second-degree perineal tear
- Third-degree perineal tear
- Fourth-degree perineal tear
- Incidence of episiotomy

For random-effects meta-analyses using methods other than inverse variance, we will assess differences between subgroups by inspection of the subgroups' confidence intervals; non-overlapping confidence intervals indicate a statistically significant difference in treatment effect between the subgroups.

Sensitivity analysis

We will, in future updates, perform sensitivity analyses to explore the effect of fixed-effect or random-effects analyses for outcomes with statistical heterogeneity. In addition, we plan to perform a sensitivity analyses excluding studies with a high risk of bias. We also plan, if such studies are available, to carry out sensitivity analyses to explore the effects of any assumptions made such as the value of intra class correlation coefficient (ICC) used for cluster-randomised trials.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of studies awaiting classification.

Results of the search

Our search strategy identified 17 citations related to 12 trials. They were identified by the Trials Search Co-ordinator and we found no additional trials by the MEDLINE and CINAHL search. We also found one additional unpublished study from a reference list (Musgrove 1997).

Of the identified studies, we included eight trials involving 11,651 randomised women. Four trials were excluded. One trial report (Harlev 2009) was presented as a poster and is awaiting classification pending further information (*see* Characteristics of studies awaiting classification).

Included studies

We included eight trials involving 11,651 randomised women (Albers 2005; Araujo 2008; Dahlen 2007; De Costa 2006; Jönsson 2008; Mayerhofer 2002; McCandlish 1998; Stamp 2001). For more details *see* Characteristics of included studies.

The included studies were conducted in hospital settings in the following countries: in New Mexico, USA (Albers 2005); in different states in Australia (Dahlen 2007; Stamp 2001); in Itapecerica da Serra, Brazil (De Costa 2006) and Sao Paulo, Brazil (Araujo 2008); in Lund, Sweden (Jönsson 2008); in Vienna, Austria (Mayerhofer 2002) and in the UK (McCandlish 1998).

The studies varied in size. Albers 2005 included 1211 women, Araujo 2008 included 106 women, Dahlen 2007 717 women, De Costa 2006 70 women, Jönsson 2008 1575 women, Mayerhofer 2002 1161 women, McCandlish 1998 5471 women and Stamp 2001 included 1340 women.

We contacted five authors (Albers 2005; Araujo 2008; Dahlen 2007; Jönsson 2008; Mayerhofer 2002) and asked for supplementing information.

Participants

The participants in the included studies were nulliparous and multiparous women expecting a vaginal birth, singleton vertex presentation at term, with no medical complications. Four studies had nulliparous as an inclusion criteria (Araujo 2008; Dahlen 2007; De Costa 2006; Jönsson 2008).

Interventions

Various interventions/perineal management techniques are described in the studies. One study compared warm compresses held to the mother's perineum and external genitalia versus hands-off, and perineal massage inside the woman's vagina versus hands-off (Albers 2005). One study compared warm packs on the perineum versus not having warm packs (Dahlen 2007). Three studies compared hands off versus hands on the perineum (De Costa 2006; Mayerhofer 2002; McCandlish 1998). One study compared massage (and stretching) of the perineum with no perineal massage (Stamp 2001); one study compared a modified Ritgen's manoeuvre with standard practice (with one hand to apply pressure on the perineum, and the other hand on the fetal occiput) (Jönsson 2008) and one study compared application of petroleum jelly to the perineum with no application of jelly (Araujo 2008). *See* Characteristics of included studies for a more detailed description of the experimental and comparison interventions.

Outcomes

The included trials had various primary outcomes. In Albers 2005 the primary outcome was an intact perineum (defined as no tissue separation). Dahlen 2007 had suturing after birth as the primary outcome (defined as perineal trauma greater than first-degree tear, any tear that was bleeding and any tear that did not fall into anatomical apposition). In De Costa 2006 the primary outcome was the degree of perineal trauma and in Jönsson 2008 it was the rate of third- and fourth-degree perineal tears. In the Mayerhofer 2002 study the primary outcome was perineal trauma (degree and episiotomy) and in the McCandlish 1998 study it was perineal pain 10 days postpartum. In Stamp 2001, the primary outcomes were: rates of intact perineum; episiotomy; and first-, second-, third- and fourth-degree tear; in Araujo 2008 the primary outcome was frequency of perineal trauma, intact perineum or trauma, degree of trauma (first or second) and location (posterior or anterior or both).

One study described perineal tears (non sphincter) degree 1 and 2 (Araujo 2008); one study described perineal tears degree 1, 2 and 3 (Mayerhofer 2002); one study described perineal tears degree 3 and 4 (Jönsson 2008) and the others described perineal tears degree 1, 2, 3 and 4 (Albers 2005; Dahlen 2007; De Costa 2006; McCandlish 1998; Stamp 2001).

Excluded studies

Four trials have been excluded (Abdolahian 2010; Most 2008; Musgrove 1997; Schaub 2008). For more details, *see* Characteristics of excluded studies.

Risk of bias in included studies

We have provided details for each trial in Characteristics of included studies. We have presented a summary of the methodological quality for each individual study in Figure 1 and a summary of methodological quality across all studies in Figure 2.

Figure 1. Methodological quality summary: review authors' judgements about each methodological quality item for each included study.

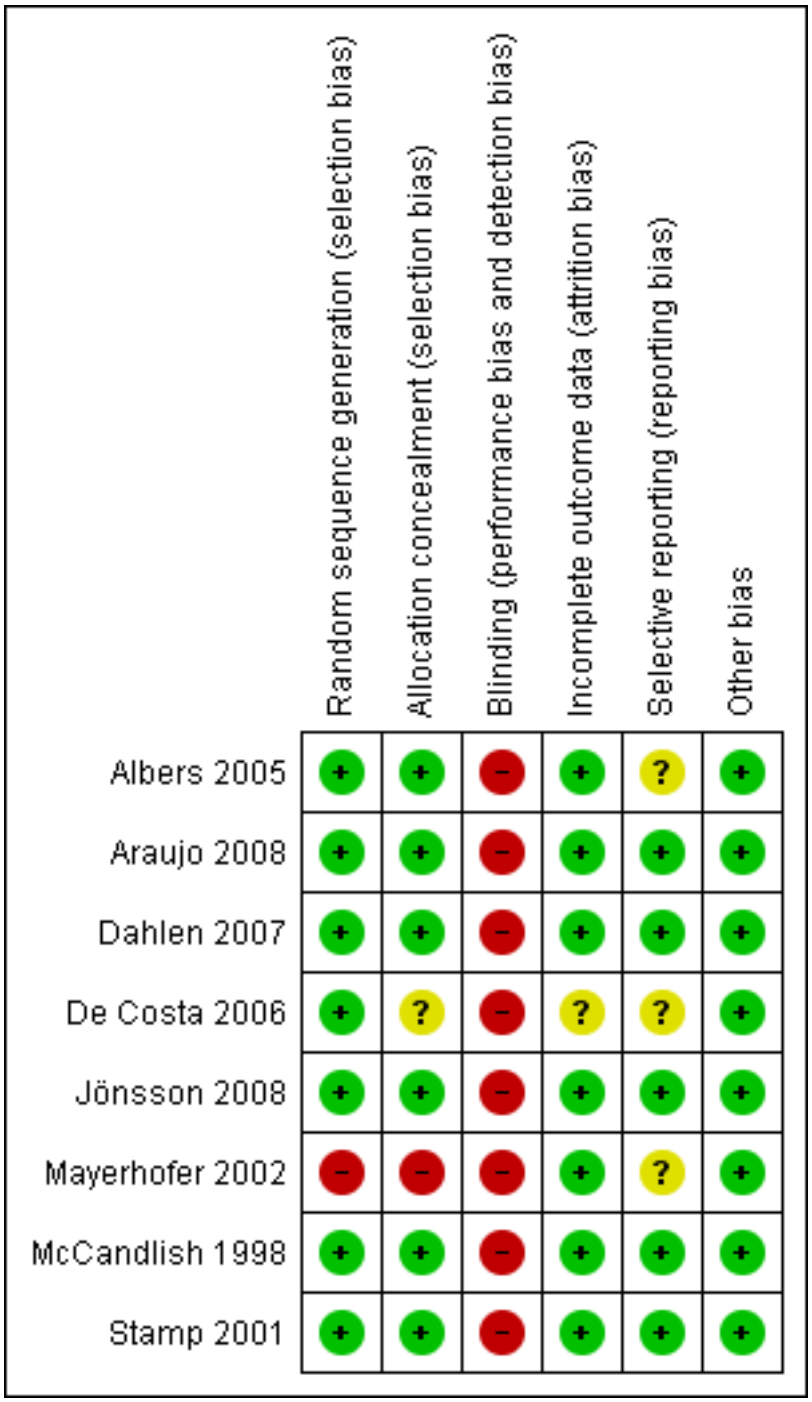
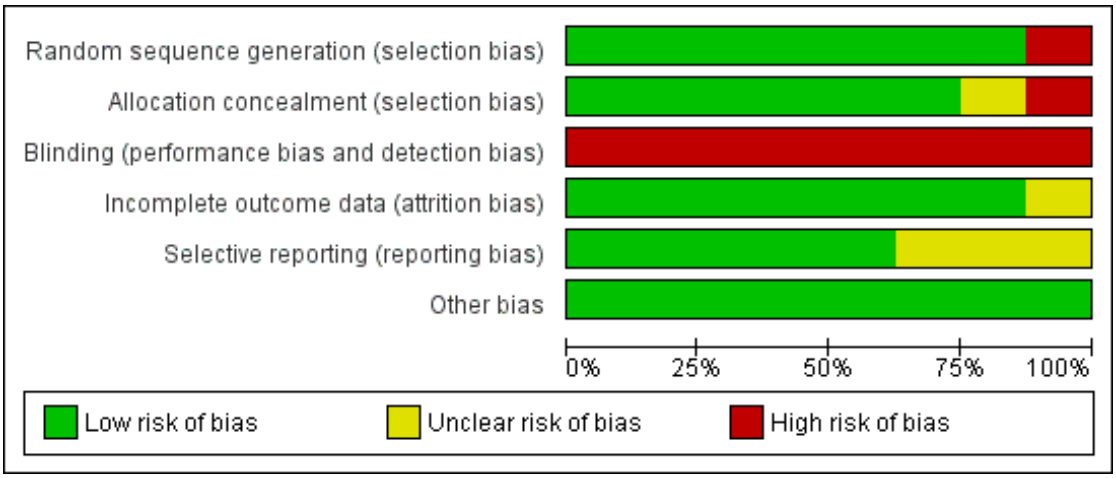


Figure 2. Methodological quality graph: review authors' judgements about each methodological quality item presented as percentages across all included studies.



Allocation

We assessed allocation concealment as 'low risk of bias' in seven of eight included studies (Albers 2005; Araujo 2008; Dahlen 2007; De Costa 2006; Jönsson 2008; McCandlish 1998; Stamp 2001). The only study that did not meet this criteria was Mayerhofer 2002, where women were randomised according to date of delivery (even or odd days).

Blinding

Given the nature of the intervention, it was not possible to blind the intervention for the clinician/the midwife performing the technique. It was also regarded impossible to blind women to the allocated group. Women's knowledge of the allocation could have biased the amount of pain they reported (Dahlen 2007). Some women may have been disappointed with the allocation group, thus affecting the results. Also, some women may have been convinced that the technique they received was best, thus causing a 'placebo' effect. In McCandlish 1998, women were not told which group they ended up in, unless the women asked for that information. When a women was informed, it was noted in the data form. About a third of the women in each group were informed of their allocation. However, the outcome assessors could have been blinded for the perineal technique. In Dahlen 2007, the outcome assessor was blinded and in the trial of Stamp 2001, nearly 75% of the outcome assessment was blinded. In most of the other included studies there was some degree of blinding. In one study, the question of blinding of the clinician and the outcome assessor was not discussed (Jönsson 2008). The other three studies lacked some essential information which could have helped the interpretation of the results.

Incomplete outcome data

Incomplete outcome data were addressed in all the studies except for De Costa 2006, which was assessed as 'high risk of bias' for this domain.

Selective reporting

We assessed five studies (Araujo 2008; Dahlen 2007; Jönsson 2008; McCandlish 1998; Stamp 2001) as being free of selective reporting bias. We assessed the other studies as 'high risk of bias'.

Other potential sources of bias

We considered three of the included studies to be free of problems that could put them at risk of bias (Jönsson 2008; McCandlish 1998; Stamp 2001). We considered the risk of other bias to be 'unclear' for four studies (Albers 2005; Araujo 2008; Dahlen 2007; Mayerhofer 2002) and one study (De Costa 2006) to be at high risk of bias. We have described the sources of other bias under Characteristics of included studies.

Effects of interventions

We performed meta-analyses for the following perineal techniques: hands off (or poised) versus hands on; warm compresses versus control (hands off or no warm compress); massage versus control (hands off/care as usual). As most of the studies reported third- and fourth-degree tears together, we chose to combine third- and fourth-degree tears as one outcome for the meta-analyses, except for analysis number 4, Ritgens manoeuvre versus standard care.

1. Hands off (or poised) versus hands on

Three studies compared hands off versus hands on the perineum (De Costa 2006; Mayerhofer 2002; McCandlish 1998). One of the studies was small and did not give any estimable effect (De Costa 2006). One study reported only on third-degree tears (Mayerhofer 2002), and one study (McCandlish 1998) reported third- and fourth-degree tears together. The average treatment effect was not significantly different from zero (risk ratio (RR) 0.73, 95% confidence interval (CI) 0.21 to 2.56, tau^2 0.67, I^2 81 %, three studies, 6617 women); however, the substantial heterogeneity means that the treatment effects in any individual study could be in either direction; *see* Analysis 1.1.

The average treatment effect on episiotomy was significantly different from zero (RR 0.69, 95% CI 0.50 to 0.96, tau^2 0.04, I^2 73%, two studies, 6547 women), but there was considerable unexplained heterogeneity between the two included studies (Mayerhofer 2002, McCandlish 1998); *see* Analysis 1.2.

When measuring the incidence of intact perineum, an outcome reported in three studies (De Costa 2006; Mayerhofer 2002; McCandlish 1998), the treatment effect was not significantly different from zero (RR 1.03, 95% CI 0.96 to 1.09, three studies, tau^2 0.00, I^2 0%, 6547 women); *see* Analysis 1.3.

2. Warm compresses versus control (hands off or no warm compress)

Two studies (Albers 2005; Dahlen 2007) compared warm compresses versus hands off or no warm compress, and the use of warm compresses led to a significant reduction in the average number of third- and fourth-degree tears (RR 0.48, 95% CI 0.28 to 0.84, tau^2 0.00 , I^2 0% two studies, 1525 women); *see* Analysis 2.1

Warm compresses did not lead to significant differences in the frequency of episiotomies (RR 0.93, 95% CI 0.62 to 1.39, tau^2 0.00 , I^2 0%, two studies, 1525 women); *see* Analysis 2.2. Furthermore, warm compresses did not result in a significant treatment effect when the presence of intact perineum was used as outcome (RR 1.05, 95% CI 0.86 to 1.26, tau^2 0.00 , I^2 0% two studies, 1525 women); see Analysis 2.3.

3 Massage versus control (hands off or care as usual)

Two studies (Albers 2005; Stamp 2001) compared massage versus hands off or care as usual, and the risk of third- and fourth-degree tears was significantly lower in the massage group (RR 0.52, 95% CI 0.29 to 0.94, tau^2 0.00 , I^2 0%, two studies, 2147 women); *see* Analysis 3.1.

Massage did not lead to an average treatment effect significantly different from zero when the rate of episiotomy was used as outcome (RR 1.42, 95% CI 0.42 to 4.87, tau^2 0.57, I^2 64%, two studies, 2147 women); however the substantial heterogeneity implies that the treatment effect could be in either direction; see Analysis 3.2. Moreover, massage was not associated with significant changes in intact perineum (RR 1.04, 95% CI 0.90 to 1.20, tau^2 0.00, I^2 0% two studies, 2147 women); *see* Analysis 3.3.

4 Ritgens manoeuvre versus standard care

One study (involving 1423 women) evaluating Ritgens manoeuvred met the inclusion criteria for this review (Jönsson 2008). The modified Ritgens manoeuvre did not lead to statistically significant changes in the incidence of third- or fourth-degree tears; *see* Analysis 4.1; Analysis 4.2; (RR 1.24, 95% CI 0.78 to 1.96) *see* Analysis 4.3. No significant effect was shown in the incidence of episiotomy (RR 0.81, 95% CI 0.63 to 1.03); *see* Analysis 4.4.

DISCUSSION

This systematic review aimed to evaluate the research evidence of how different perineal techniques could contribute in reducing the severity and frequency of perineal trauma. The review summarises eight trials involving 11,651 women. The trials took place in six different countries, all in hospital settings. There was great variation in methodological quality of the trials. Five of the studies had low risk of problems that could put them in risk of bias (Araujo 2008; Dahlen 2007; Jönsson 2008; McCandlish 1998; Stamp 2001). We were uncertain about the risk of bias in three of the studies (Albers 2005; De Costa 2006; Mayerhofer 2002). All the included trials explored different perineal management techniques. These included: warm compresses held to the mother's perineum or perineal massage inside the woman's vagina versus hands off, warm compresses on the perineum versus not having warm compresses, various hands-on techniques versus hands-off techniques, massage of the perineum versus not massage and a modified Ritgen's manoeuvre versus standard practice. The studies measured various outcomes, but they all reported on condition of the perineum in one way or another, for example by presenting the number of women with an intact perineum, the frequency of the need for suturing after birth or the degree and location of perineal tears.

The results of our meta-analyses comparing hands on versus hands off suggest that practicing the hands-off technique reduces the use

of episiotomy. This result is based on two studies (Mayerhofer 2002; McCandlish 1998). Even though the rate of episiotomy was reduced, there was no significant increase of third- and fourth-degree tears. Other meta-analyses have also shown that restrictive episiotomy resulted in less severe perineal trauma (Carroli 2010). No significant differences in the risk of perineal trauma and episiotomy were observed when comparing modified Ritgen's manoeuvre versus standard technique. We did observe a significant reduction in incidence of third- and fourth-degree perineal tears when the perineal technique of holding warm compresses against the perineum was used compared to no application of warm compresses against the perineum. These results are based on two studies (Albers 2005; Dahlen 2007). We also observed a significant effect of massage of perineum versus no massage (Albers 2005; Stamp 2001).

The studies in our meta-analyses have considerable clinical heterogeneity. The perineal techniques of the studies were different. The terms "hands on", "hands off", "standard care" and "perineal support" meant different things across the studies and are not always defined sufficiently. In McCandlish 1998, "hands off" not only meant no hand on the perineum and infant's head until the head was born but, also no manual assistance for the birth of the shoulders. While Mayerhofer 2002 defined "hands off" as no hands on the perineum or fetal head until the head was born, but made no distinction between "hands on" and "hands off" for the assistance of the birth of the shoulders. Most extreme is the "hands off" in Albers 2005, where "hands off" only meant no hands on the perineum until crowning of the head. Although the standard care or "hands on" manual support techniques are poorly described in most of the studies, it is clear that all studies aimed at a slow and controlled delivery of the head.

We were not able to perform all the analyses proposed in the protocol for all the primary and secondary outcomes recorded, as the included studies did not contribute enough data.

It was not possible to blind the intervention for the midwives in the involved trials. It may be difficult to blind the outcome assessor, but it is not impossible and future trials should definitely attempt to do so. Theoretically, midwives' convictions about the advantage or disadvantage of the intervention could be influenced by this in their evaluation of the perineal outcome.

There are reasonable data to support the use of warm compresses. It showed a reduction in severe perineal trauma and also other benefits, such as reduced pain and reduced incidence of urine incontinence. The procedure can be offered to women; it has probable absence of harm and it is cheap. In addition, the procedure has been shown to be acceptable to both women and midwives (Dahlen 2009).

AUTHORS' CONCLUSIONS

Implications for practice

There are reasonable data to support the use of warm compresses. From the meta-analyses It showed a reduction in severe perineal trauma.

Implications for research

A limitation of this review is that it only considers perineal techniques and not all the factors of the birth process. The question of how to prevent the tears is complicated and involves many other factors in addition to the perineal techniques that are evaluated here. It has to do with the birth position, the women's tissue and other ways to control the speed of the delivery. Maybe a controlled delivery, controlled by the midwife or by the woman, controlled by breathing technique instead of support, may be even more important. Further research in this field is necessary.

Further RCTs could be performed evaluating perineal techniques, warm compresses and massage.

More research is also needed to answer the questions of determinants of perineal trauma. We still do not know enough of the effect of, for example, training, demographic factors or nutrition as determinants.

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As part of the pre-publication editorial process, this review has been commented on by three peers (an editor and two referees who are external to the editorial team), a member of the Pregnancy and Childbirth Group's international panel of consumers and the Group's Statistical Adviser.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Albers 2005

Methods	RCT. Procedure: computer-generated block randomisation (1:1:1 within balanced blocks). Unit of randomisation: women in midwifery care were recruited antenatally but randomised in active labour when vaginal delivery appeared likely
Participants	1211 women were included. Inclusion criteria: patients in midwifery care, 18 years or older, healthy, expecting a vaginal birth, no medical complications, a singleton vertex presentation at term. Exclusion criteria: those who did not meet the inclusion criteria
Interventions	Experimental interventions: Compresses versus hands off and massage versus hands off. 1) Warm compresses were held continuously to the mother's perineum and external genitalia by the midwife's gloved hand during and between pushes, regardless of mother's position 2) Perineal massage with lubricant was gentle, slow massage, with 2 fingers of the midwife's gloved hand moving from side to side just inside the patient's vagina. Mild, downward pressure (toward the rectum) was applied with steady, lateral strokes, which lasted 1 second in each direction. This motion precluded rapid strokes or sustained pressure. A sterile, water-soluble lubricant was used to reduce friction with massage. Massage was continued during and between pushes, regardless of maternal position and the amount of downward pressure was dictated by the woman's response Comparison: 3) No touch the woman's perineum until crowning of the infant's head
Outcomes	Primary outcome was intact perineum (defined as no tissue separation at any site) Secondary outcomes: episiotomy, degree of trauma (1^{st}, 2^{nd}, 3^{rd}, 4^{th}), location of trauma (vaginal, labial, periurethral, clitoral, cervical), trauma sutured and from the postpartum visit: presence of anatomic abnormalities, faulty healing of childbirth lacerations, and continued perineal pain. Reported as postpartum perineal problems
Notes	Contact with the author did not supply us with further information of secondary outcome such as breastfeeding, maternal satisfaction with birth, stress incontinence or dyspareunia

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer generated, ratio 1:1:1 within balanced blocks.
Allocation concealment (selection bias)	Low risk	Sequentially numbered, sealed, opaque envelopes were prepared by the data manager and study administrator and stored in metal box in a restricted area at the hos-

Albers 2005 (*Continued*)

		pitals labour unit. The clinical midwife selected the lowest numbered envelope once vaginal birth appeared likely. The envelope contained a card with the study group allocation. When the envelope was drawn, the midwife signed the study register and noted date and time.
Blinding (performance bias and detection bias) All outcomes	High risk	It was not possible to blind the intervention for the participant or the clinician. The outcome assessment was done by the midwife that performed the delivery, and thus not blinded, but to counter this potential bias, a random 25% of the study births had a 2nd midwife observer present (additional information by contact with the author)
Incomplete outcome data (attrition bias) All outcomes	Low risk	There were no loss to follow-up for primary outcome after randomisation. Some (88 + 79 + 79) lost to follow-up for data from the postpartum visit. There was no exclusion after randomisation. The analysis was intention to treat
Selective reporting (reporting bias)	Unclear risk	There is no description of what healthy and no medical problems means. A suggestion in the article: concealment of the allocated perineal strategy from the clinical midwife was not possible - therefore a potential for reporting bias in data collection immediate after birth was a possibility
Other bias	Low risk	Very low episiotomy rate at baseline, under 1%. They also have a high baseline of intact perineum compared to most others

Araujo 2008

Methods	RCT.
Participants	106 women were included. Inclusion criteria: no previous vaginal births; age $\geq$ 15 years, gestational age 37- 41 6/7weeks, live single cephalic fetus with no abnormality detected, uterine height no more than 36 cm, cervical dilatation of 5 cm or less, no perineal preparation during pregnancy, no infection in the perineum, agree to use the lateral left size position during delivery Exclusion criteria: use of oxytocin, obstetrical conditions during labor and delivery which required intervention as episiotomy, forceps and caesarean Nulliparous women.

Interventions	Experimental intervention: petroleum jelly was applied to the entire area of the perineum with 2 fingers, using a sweeping motion. The clitoris, labia majora, labia minora, vestibule, fourchet and perineal body were covered with 30 ml of the lubricant without any stretching or massage of the complete cervical dilatation until the beginning of the cephalic delivery. It was done time after time from the complete cervical dilatation until the beginning of the cephalic delivery Control/comparison intervention: routine care, did not receive the jelly
Outcomes	Perineal conditions: frequency, intact perineum or trauma, degree of trauma (1^{st}, 2^{nd}) and location (posterior or anterior or both). Newborn outcomes: Apgar score Expulsive period length: the time between full cervical dilatation to fetal delivery
Notes	We contacted the author and were provided with more information on why the inclusion took so long time, on details on the application of the jelly on the perineum and of the routine care in the hospital

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	The randomisation was computer-generated random numbers
Allocation concealment (selection bias)	Low risk	The nurse-midwifes were informed about which group (control or experimental) the woman was allocated by the researcher when the woman was in the expulsive period
Blinding (performance bias and detection bias) All outcomes	High risk	
Incomplete outcome data (attrition bias) All outcomes	Low risk	106 were assessed for eligibility at stage 1, 3 excluded because of exclusion criteria (2) and lack of consent (1). After randomisation:15 excluded from the intervention and 12 from the control group because of episiotomy
Selective reporting (reporting bias)	Low risk	
Other bias	Low risk	Very few women followed the eligibility criteria: 106 of > 600 primiparas.

Dahlen 2007

Methods	RCT. Randomly generated numbers with participants being stratified into 6 subgroups by age and ethnicity Unit of randomisation: nulliparous women in the late second stage of labour. Pregnant women were asked at the antenatal clinics or in the labour ward if they were not in labour
Participants	717 women were included. Inclusion criteria: nulliparous women, at least 36 weeks' pregnant, singleton pregnancy with a cephalic presentation; anticipated a normal birth, who had not performed perineal massage antenatally and were older than 16 years Exclusion criteria: women not fulfilling the inclusion criteria and those women who experienced intrauterine fetal death The 6 strata were: Asian younger than 25, non-Asian younger than 25, Asian 25 to 34 years old, non-Asian 24 to 34 years old, Asian older than 34 and non-Asian older than 34
Interventions	Experimental intervention: 1) warm packs/pads on the perineum as the baby's had began to distend the perineum and the woman was aware of a stretching sensation. A sterile pad was soaked in a metal jug with boiled tap water (between 45 and 59 degrees C) then wrung out and gently placed on the perineum during contractions. The pad was re-soaked to maintain warmth between contractions. The water in the jug was replaced every 15 min until delivery Comparison: standard group which did not have warm pack applied to their perineum in second stage
Outcomes	Primary outcome was suturing after birth (defined as perineal trauma greater than first-degree tear, any tear that was bleeding and any tear that did not fall into anatomical apposition) Secondary outcomes: degree of trauma divided into minor or no trauma (intact, 1^{st} degree, vaginal/labial tear), major trauma (2^{nd}, 3^{rd}, 4^{th} degree and episiotomy), episiotomy and severe perineal trauma including 3^{rd} and 4^{th} degree tears. Other secondary outcome: pain when giving birth, and perineal pain on day 1 and 2, at 6 weeks and 3 months and urinary incontinence, sexual intercourse and breastfeeding
Notes	We contacted the author and asked for additional information according to more detailed data on the perineal trauma and for this reviews secondary outcomes but such data were not available

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomisation by the National Health and Medical Research Clinical Trials Centre using randomly generated numbers. The article does not state if this was computer generated, but it is perfectly possible to randomly generate numbers without a computer

Allocation concealment (selection bias)	Low risk	Randomisation by the National Health and Medical Research Clinical Trials Centre using randomly generated numbers. Sealed, opaque envelopes at the National Health and Medical Research Clinical Trials Centre kept at the neonatal intensive care unit to ensure remote allocation concealment, with randomisation occurring as close as possible to second stage of labour
Blinding (performance bias and detection bias) All outcomes	High risk	It was not possible to blind the intervention for the participant or the clinician. An independent, senior midwife, blinded to the allocation group, was asked to give an independent assessment of the degree of perineal trauma after birth and whether or not suturing was required. Midwives were instructed not to let the other midwives know the allocation. For this purpose the equipment for the intervention was set up for every woman in the trial regardless of allocated group
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss of outcome data for the primary outcome. However, some loss of data for pain scores No participants were excluded after randomisation, but in both groups a number of women did not receive the care they were allocated to due to surgical intervention. A couple refused the allocated treatment. 1 gave birth too fast, 1 delivered in water and 1 received the intervention treatment while allocated to standard care. The analysis was intention to treat
Selective reporting (reporting bias)	Low risk	
Other bias	Low risk	Took a long time to include enough participants, from 1997 to 2004 Recruitment stopped at 717, only 599 women actually received the allocated treatment. 95 less than required by the power calculation. In the flow chart it is stated that 1047 were assessed for eligibility while only 717 were randomised. The main reason for not randomising was that midwives were too busy.

		It is difficult to know if this introduced bias It was difficult to differentiate between intact perineum and trauma. The classification of the degree of perineal trauma makes it difficult to compare to other studies

De Costa 2006

Methods	RCT. Prosedyre: electronically produced randomised tables. Unit of randomisation: pregnant nulliparous women in labour
Participants	70 women were included. A hospital birth centre, in Etapecerica de Serra, Brazil. Low-risk pregnancies receive antenatal care in the basic healthcare units. The birth centre has an average of 403 deliveries a month (71% vaginal birth), and nurse-midwives attend 100% of the births Inclusion criteria: primiparous expectant mothers aged 15 to 35, full-term pregnancies and vertex presentation. On admission: uterine height more than 36 cm, cervical dilatation 8 cm or less, intact membranes. Additional limitations were that labour did not exceed 12 hours after hospitalisation, no use of oxytocin during the first or second stage of labour, no perineal preparation during pregnancy or no episiotomy Exclusion criteria: women were excluded if there was dystocia requiring any other procedure than those described in the detailed description of the 2 methods compared. Women were excluded if they chose to deliver in the lithotomy position, if they had a caesarean section, if there were any abnormalities during labour related to fetal distress
Interventions	Experimental intervention: hands off: during the expulsive period, the nurse-midwife's conduct is exclusively expectant, only observing the successive movements of restitution, external rotation, delivery of the shoulders and the remainder of the body. During delivery, the nurse-midwife should support the baby's head with one hand and the baby's torso with the other hand. If external rotation of the head or delivery of the shoulders does not occur spontaneously within 15 seconds of the delivery of the head, or if the newborn appear hypoxic, the professional must manually rotate the head by grasping it and applying gentle downward tracking. Once the anterior shoulder is delivered, gentle upward traction is used to deliver the posterior shoulder. After the shoulders have been delivered, the newborn's neck is held with one hand, while the other hand follows along the infant's back, and the legs or feel are grasped as they are delivered Comparison: hands on: when the infant's head is crowning, the nurse-midwife places the index, middle ring and little fingers of the left hand close together on the infant's occiput, with the palm turned toward the anterior region of the perineum. In this manner, expulsion is controlled, by maintaining the flexion of the head, protecting the anterior region of the perineum and bilaterally supporting the ischio-cavernous and bulbo- cavernous muscles, the urethral introitus, and the labia majora and minora. Simultaneously, the right hand is flattened out and placed on the posterior perineum, with the index finger and the thumb, forming a "U" shape, exerting pressure on the posterior region of the perineum during the crowning process. The nurse-midwife leaves no area without protection, particularly the region of the fourchette. During the delivery of the shoulders and the remainder of the body, the right hand is kept in place, protecting the posterior region of the perineum, while the left hand supports the infant's head,

	allowing external rotation and the delivery of the shoulders spontaneously. If this does not occur, the professional continues with posterior perineal pressure, and with the left hand, pulls gently downward to deliver the anterior shoulder. Once the anterior shoulder is delivered, gentle traction is applied upward to ease delivery of the posterior shoulder. After both shoulders have been delivered, the practitioner removes the right hand from the posterior perineum and supports the infant's neck with one hand, while supporting the remainder of the body with the other hand In both techniques, the women are allowed to push spontaneously during labour, without being directed in bearing down efforts, responding to involuntary contractions of the abdominal muscles
Outcomes	1) Perineal conditions (frequency, degree (intact perineum, 1^{st}, 2^{nd}, 3^{rd} and 4^{th}), and location of perineal laceration) 2) newborn outcomes, Apgar score, length of second stage
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Electronically produced randomised table. It is not clear when randomisation took place (those with episiotomy excluded?)
Allocation concealment (selection bias)	Unclear risk	Electronically produced randomised table. The researchers supervised both allocation to groups and delivery technique. Insufficient information about concealment It is not clear when randomisation took place. Not intention to treat for 16 women who were included at first
Blinding (performance bias and detection bias) All outcomes	High risk	Nurse-midwives attended the births and filled out the data collection forms after each birth
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	16 women were excluded after first meeting the inclusion criteria and presumably having been included first, women receiving an episiotomy, women who chose to give birth in an lithotomy position, possibly also some women receiving oxytocin after randomisation and some with fetal distress. The analysis was not intention to treat as women with an episiotomy were not included in the analysis. Presumably randomisation took place before that

De Costa 2006 (*Continued*)

Selective reporting (reporting bias)	Unclear risk	There is no report on the 16 women excluded after inclusion? Why were they excluded. Which group did they belong to? Are the results of this study generalis able after so many exclusion criteria? Extreme selection
Other bias	Low risk	

Jönsson 2008

Methods	RCT. Unit of randomisation: women in the beginning of the second stage of labour at full cervical dilatation
Participants	1575 women were included. Inclusion criteria: eligible for the study were primigravida, women with singleton pregnancy, fetus in cephalic presentation, admitted for labour, rupture of the membranes or induction after 37 weeks Women were asked for consent on admission in labour. Exclusion criteria: instrumental deliveries, emergency caesarean deliveries, parous women and preterm deliveries that had been erroneously included
Interventions	Experimental intervention: modified Ritgen's manoeuvre: lifting the fetal chin interiorly, using the fingers of one hand placed between anus and coccyx, and thereby extending the fetal neck, whereas the other hand should be place on the fetal occiput to control the pace of expulsion of the fetal head. The maneuver was used during a uterine contraction Control/comparison intervention: the standard practice at delivery was using one hand to apply pressure against the perineum, and the other hand on the fetal occiput to control the expulsion of the fetal head. Standard practice was also to perform a lateral episiotomy only on indication
Outcomes	The rate of third-to fourth-degree perineal ruptures including external anal sphincter
Notes	We contacted the author and asked for additional information according to more data on the perineal trauma (intact perineum, perineal trauma not requiring suturing, perineal trauma requiring suturing, 1st- and 2nd-degree tear) but these data were not registered in the study

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	The allocated randomisation was registered in an existing clinical data base, containing information of all deliveries at the 2 units

Jönsson 2008 (*Continued*)

Allocation concealment (selection bias)	Low risk	The allocated randomisation was registered in an existing clinical data base, containing information of all deliveries at the 2 units. Randomisation was done at the beginning of the second stage of labour (at full cervical dilatation) at each unit by a phone call from the delivering midwife to the other department, where randomisation lists with number of allocation were kept
Blinding (performance bias and detection bias) All outcomes	High risk	Blinding of the clinician and the patient is not discussed in the article. The diagnosis and initial grading of perineal ruptures were primarily made by the delivering midwives. If the midwife suspected involvement of the anal sphincter, or if she was in doubt, she called the obstetrician on duty
Incomplete outcome data (attrition bias) All outcomes	Low risk	There is a flowchart in the article that describes any loss to follow-up. The flow chart describes the excluded participants: failure in the randomisation itself is also described in detail. After randomisation: 71 women were excluded from the intervention group (7 because of caesarean delivery, 64 instrumental delivery) 81 women were excluded from the control group after randomisation (3 because of caesarean delivery, 78 instrumental delivery) For the remaining 1423 women, the results were analysed according to intention to treat
Selective reporting (reporting bias)	Low risk	
Other bias	Low risk	

Mayerhofer 2002

Methods	Quasi-randomised study. Women were randomised according to date of delivery (even or odd day). Unit of randomisation: pregnant women entering the second stage of delivery
Participants	1161 women were included. Inclusion criteria: all women with an uncomplicated pregnancy and cephalic presentation, normal first and second stages of labour, gestational age > 37 weeks. Exclusion criteria: women with multiple pregnancy, non-cephalic presentation, caesarean section, forceps, vacuum, planned birth in water, visible perineal scar, language difficulties, gestation < 37 weeks

Mayerhofer 2002 (*Continued*)

Interventions	Experimental intervention: the midwife keeps her hands poised, ready to put light pressure on the infants head to avoid rapid expulsion. However, in contrast to the hands-on method, the midwife does not touch the perineum with her right hand at any time during delivery. Delivery of the shoulders is supported with both of the midwife's hands. Control/comparison intervention: hands on method: the left hand of the midwife puts pressure on the infants head in the belief that flexion will be increased. The right hand is placed against the perineum to support this structure and to use lateral flexion to facilitate delivery of the shoulders
Outcomes	Maternal outcomes: perineal tear,1^{st} , 2^{nd} 3^{rd} degree, vaginal, labial, episiotomy (median or lateral). Neonatal outcomes: infant birthweight, length, head diameter, infant shoulders, Apgar score (1 min < 7, 5 min < 7) and cord pH < 7.1) (All perineal trauma were confirmed by an experienced obstetrician-gynaecologist.)
Notes	We tried to contact the author and asked for supplementing information but did not succeed. We would like to know what the authors meant by "visible perineal scar" and for information of "perineal trauma requiring suturing", whether they had calculated the mean and the standard deviation of the length of second stage and how they defined the length of the second stage. We also asked for more details on the differences between the groups for the characteristics in table 1 and how the authors defined "normal in the first and the second stage. In addition, were the women with augmented labour, continuous fetal monitoring and prolonged labour excluded from the study

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Randomised according to the date of delivery. On even days and odd days. Noon as a break point of randomisation. Women entering the second stage of labour before noon and delivering after noon were treated according to the randomisation policy of the previous day. Quasi-randomisation
Allocation concealment (selection bias)	High risk	Randomised according to the date of delivery. On even days and odd days. Noon as a break point of randomisation. Women entering the second stage of labour before noon and delivering after noon were treated according to the randomisation policy of the previous day. There was no concealment
Blinding (performance bias and detection bias) All outcomes	High risk	It was not blinded for the participant: for the clinician blinding was not possible. For the outcome assessor it is unclear whether it was blinded.

Mayerhofer 2002 (*Continued*)

		All perineal tears were confirmed by an experienced obstetrician
Incomplete outcome data (attrition bias) All outcomes	Low risk	Data were missing from 85 women (40 + 45) = 5, 6% of the total number of deliveries. Due to incomplete study forms. Describe any exclusion of participants after randomisation: the analyses were performed according to group assignment irrespective of the form of perineal care delivered, i.e. Intention to treat
Selective reporting (reporting bias)	Unclear risk	It is not possible to extract from the article if the primiparas was divided equally between groups It is unclear if there are significant differences between the groups for the characteristics in table 1 (characteristics of the clinical population).
Other bias	Low risk	

McCandlish 1998

Methods	RCT. Block randomisation, with blocks of 4 to 8, stratified by centre. Unit of randomisation: pregnant women at the end of the second stage when the midwife considered a vaginal birth imminent
Participants	5471 women were included. Recruitment and randomisation happened at 2 hospitals, both National Health Service hospitals in England (not private but for the general public funded by the state). Both hospitals had approximately 5500 births a year Inclusion criteria: women with a singleton pregnancy with cephalic presentation, anticipating a normal birth giving consent antenatally Exclusion criteria: women planning to have a water birth, women who had an elective episiotomy prescribed, women planning adoption. Women were excluded on admission if they gave birth before 37 weeks' gestation
Interventions	Experimental intervention: hands poised method in which the midwife keeps her hands poised, prepared to put light pressure on the baby's head in case of rapid expulsion, but not to touch the head or perineum otherwise and to allow spontaneous delivery of the shoulders Control/comparison intervention: hands on method in which the midwife's hands are used to put pressure on the baby's head in the belief that flexion will be increased, and to support (guard) the perineum, and to use lateral flexion to facilitate the delivery of the shoulders

Outcomes	Primary outcome was perineal pain in the previous 24 hours reported by the mother 10 days after birth (formed the basis for the power calculation). Other outcomes recorded: perineal trauma, if trauma was sutured, perineal pain at around 2 days and 3 months after birth, dyspareunia at 3 months, urinary and bowel problems at 10 days and 3 months and breastfeeding at 10 days and 3 months. For the newborn the Apgar score, if applicable type of resuscitation given, admission with reason for the admission were recorded
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Details of the allocated group were given on coloured cards contained in sequentially numbered, opaque, sealed envelopes. Prepared at the National Perinatal Epidemiology Unit and kept in an agreed location on each labour ward. To enter a woman into the study the midwife opened the next consecutively numbered envelope. If an envelope was not opened, the reason for non-use was recorded by the midwife who had drawn it. All envelopes, whether used or not were returned to the NPEU. Unopened but not used envelopes were not returned to the unit
Allocation concealment (selection bias)	Low risk	Details of the allocated group were given on coloured cards contained in sequentially numbered, opaque, sealed envelopes, prepared at the National Perinatal Epidemiology Unit and kept in an agreed location on each labour ward. To enter a woman into the study the midwife opened the next consecutively numbered envelopes. If an envelope was not opened, the reason for non-use was recorded by the midwife who had drawn it. All envelopes, whether used or not were returned to the NPEU. Unopened but not used envelopes were not returned to the unit.
Blinding (performance bias and detection bias) All outcomes	High risk	Women were not told which group they ended up in but the information was given at the woman's request, this was noted in the trial data form. About a third of the women were informed of their allocation

McCandlish 1998 (*Continued*)

		Outcome assessor: the main outcome was pain at 10 days after birth as reported by women through a questionnaire. Even though women may not have asked the midwife about allocation she may have felt or noticed what the midwife did with her hands. The other outcome such as degree of perineal trauma and condition of the newborn at birth was presumably recorded by the midwife who did the delivery and knew the allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	During the study period, 18,458 deliveries took place. There is a detailed flow chart that describes the excluded participants. The reasons for not being randomised were: Not recruited ante natally, planned instrumental delivery or Caesarean section, maternal refusal, non-cephalic presentation, multiple pregnancy, planned birth in water, intrauterine death, episiotomy prescribed and other. However 5471 (29.6%) women were randomised into experimental group 2740 and controls 2731. There was no exclusion after randomisation. The analysis was intention to treat
Selective reporting (reporting bias)	Low risk	The article is very open about all aspects of interest.
Other bias	Low risk	

Stamp 2001

Methods	RCT 1:1, prepared batches of 100. Stratification for nulliparous and multiparous women Unit of randomisation: women in uncomplicated labour having progressed to either visible vertex, full dilatation or 8 cm or more if nulliparous and 5 cm or more if multiparous
Participants	1340 women were included. From 3 hospitals in Australia with 7000 births per year (presumably the 3 together and not at each hospital). It took nearly 3 years to collect the data. From March 1995 to January 1998 Inclusion criteria: women who at 36 weeks of pregnancy had given written consent while expecting a normal vaginal birth of a single baby and who presented in uncomplicated labour having progressed to either visible vertex, full dilatation or 8 cm or more if nulliparous and 5 cm or more if multiparous. English speaking Exclusion criteria: not specified specifically.

Stamp 2001 (*Continued*)

Interventions	Experimental intervention: massage and stretching of the perineum with each contraction during the second stage of labour. The midwife inserted 2 fingers inside the vagina and using a sweeping motion, gently stretched the perineum with water soluble lubricating jelly, stopping if it was uncomfortable Control/comparison intervention: the midwife's usual technique but refraining from perineal massage
Outcomes	Main outcome was intact perineum. Primary outcome was perineal trauma defined in 1^{st}, 2^{nd}, 3^{rd}, 4^{th} degree tear. Secondary outcomes were pain at 3 days, 10 days and 3 months postpartum, resumption of sexual intercourse, dyspareunia and urinary and faecal urgency
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Envelopes were sequentially numbered, prepared by a research assistant not involved in care of the women. It appears that each hospital had their own boxes for nulliparous and multiparous women
Allocation concealment (selection bias)	Low risk	Envelopes were sequentially numbered, prepared by a research assistant not involved in care of the women. It appears that each hospital had their own boxes for nulliparous and multiparous women. To find out allocation the midwife had to ring to the emergency department were the duty midwife or clerk opened the next double packed, sealed envelope
Blinding (performance bias and detection bias) All outcomes	High risk	It was not possible to blind the intervention for the participant or the clinician. Data on outcome by an independent caregiver were available in 1053 (79%) of the cases.
Incomplete outcome data (attrition bias) All outcomes	Low risk	3050 eligible women were approached. However, in that period about 19,000 women gave birth at these 3 hospitals. It appears likely that quite a number of eligible women were not asked Of the 2291 who consented only 1340 were randomised. The reasons for not randomising women were as follows: 217 caesarean section, 105 instrumental birth, 168 no

Stamp 2001 (*Continued*)

		reason, 112 women changed their mind, 121 rapid progress, 77 midwife forgot, 80 midwife too busy, 71 other reasons There were no exclusions after randomisation. The analyses was performed according to intention to treat.
Selective reporting (reporting bias)	Low risk	
Other bias	Low risk	

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Abdolahian 2010	This randomised controlled trial did not have perineal tear as an outcome and therefore not suitable for this review. Besides this is only a small abstract and too little methodological information
Most 2008	This study is presented as a short abstract and investigated the usefulness of perineal lubrication in decreasing the episiotomy rates in primiparous women. It is excluded from our review because there was insufficient information about methodological issues
Musgrove 1997	This RCT was conducted to evaluate the effect of perineal preservation and heat application during second stage of labour. It is excluded from our review because of methodological weaknesses, especially in the procedure of randomisation and lack of reporting of outcome
Schaub 2008	This RCT was conducted to determine whether obstetric gel shortened the second stage of labour or exerted a protective effect on the perineum. It is not a perineal technique in the second stage of labour and therefore not suitable for this review

Characteristics of studies awaiting assessment *[ordered by study ID]*

Harlev 2009

Methods	Prospective, randomised double blind study.
Participants	164 women undergoing vaginal deliveries between July 2008 and July 2009. Multiple gestations excluded
Interventions	Liquid wax (jojoba oil) versus purified formula of almond and olive oil, enriched with vitamin B1, B6 E and fatty acids
Outcomes	Perineal lacerations, number of sutures and length of suturing

Notes	This randomised controlled trial was presented as a poster.

DATA AND ANALYSES

Comparison 1. Hands off (or poised) versus hands on

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 3rd or 4th degree tears	3	6617	Risk Ratio (M-H, Random, 95% CI)	0.73 [0.21, 2.56]
2 Episiotomy	2	6547	Risk Ratio (M-H, Random, 95% CI)	0.69 [0.50, 0.96]
3 Intact perineum	2	6547	Risk Ratio (M-H, Random, 95% CI)	1.03 [0.95, 1.12]

Comparison 2. Warm compresses versus control (hands off or no warm compress)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 3rd or 4th degree tears	2	1525	Risk Ratio (M-H, Random, 95% CI)	0.48 [0.28, 0.84]
2 Episotomy	2	1525	Risk Ratio (M-H, Random, 95% CI)	0.93 [0.62, 1.39]
3 Intact perineum	2	1525	Risk Ratio (M-H, Random, 95% CI)	1.05 [0.86, 1.26]

Comparison 3. Massage versus control (hands off or care as usual)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 3rd or 4th degree tears	2	2147	Risk Ratio (M-H, Random, 95% CI)	0.52 [0.29, 0.94]
2 Episiotomy	2	2147	Risk Ratio (M-H, Random, 95% CI)	1.42 [0.42, 4.87]
3 Intact perineum	2	2147	Risk Ratio (M-H, Random, 95% CI)	1.04 [0.90, 1.20]

Comparison 4. Ritgen's manoeuvre versus standard care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 3rd degree tears	1	1423	Risk Ratio (M-H, Random, 95% CI)	1.42 [0.86, 2.36]
2 4th degree tears	1	1423	Risk Ratio (M-H, Random, 95% CI)	0.60 [0.18, 2.03]
3 3rd or 4th degree tears	1	1423	Risk Ratio (M-H, Random, 95% CI)	1.24 [0.78, 1.96]
4 Episiotomy	1	1423	Risk Ratio (M-H, Random, 95% CI)	0.81 [0.63, 1.03]

Analysis 1.1. Comparison 1 Hands off (or poised) versus hands on, Outcome 1 3^{rd} or 4^{th} degree tears.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 1 Hands off (or poised) versus hands on

Outcome: 1 3^{rd} or 4^{th} degree tears

Study or subgroup	Hands off n/N	Hands on n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
De Costa 2006	0/35	0/35		0.0 [0.0, 0.0]
Mayerhofer 2002	5/502	16/574		0.36 [0.13, 0.97]
McCandlish 1998	40/2740	31/2731		1.29 [0.81, 2.05]
Total (95% CI)	**3277**	**3340**		**0.73 [0.21, 2.56]**

Total events: 45 (Hands off), 47 (Hands on)

Heterogeneity: Tau?? = 0.67; Chi?? = 5.23, df = 1 (P = 0.02); I?? =81%

Test for overall effect: Z = 0.49 (P = 0.63)

Test for subgroup differences: Not applicable

Analysis 1.2. Comparison 1 Hands off (or poised) versus hands on, Outcome 2 Episiotomy.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 1 Hands off (or poised) versus hands on

Outcome: 2 Episiotomy

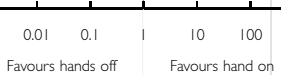
Study or subgroup	Hands off n/N	Hands on n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Mayerhofer 2002	51/502	103/574		41.4 %	0.57 [0.41, 0.77]
McCandlish 1998	280/2740	351/2731		58.6 %	0.80 [0.69, 0.92]
Total (95% CI)	**3242**	**3305**		**100.0 %**	**0.69 [0.50, 0.96]**

Total events: 331 (Hands off), 454 (Hands on)

Heterogeneity: Tau?? = 0.04; Chi?? = 3.69, df = 1 (P = 0.05); I?? =73%

Test for overall effect: Z = 2.21 (P = 0.027)

Test for subgroup differences: Not applicable

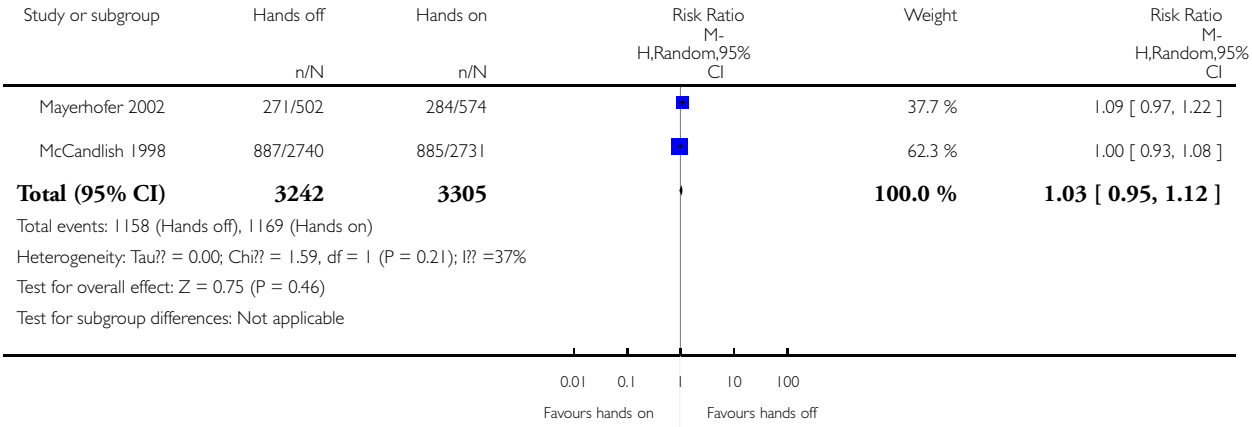


Analysis 1.3. Comparison 1 Hands off (or poised) versus hands on, Outcome 3 Intact perineum.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 1 Hands off (or poised) versus hands on

Outcome: 3 Intact perineum

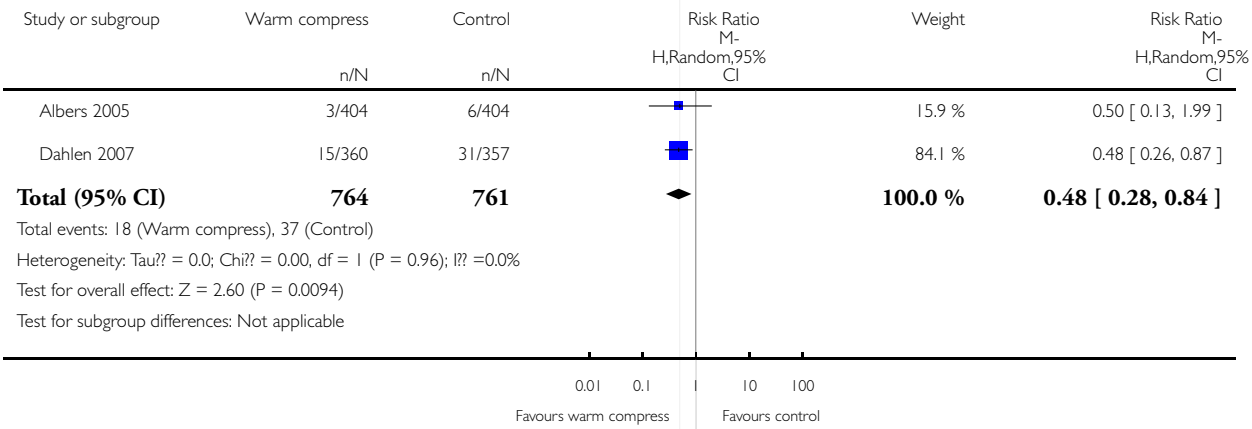


Analysis 2.1. Comparison 2 Warm compresses versus control (hands off or no warm compress), Outcome 1 3^{rd} or 4^{th} degree tears.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 2 Warm compresses versus control (hands off or no warm compress)

Outcome: 1 3^{rd} or 4^{th} degree tears

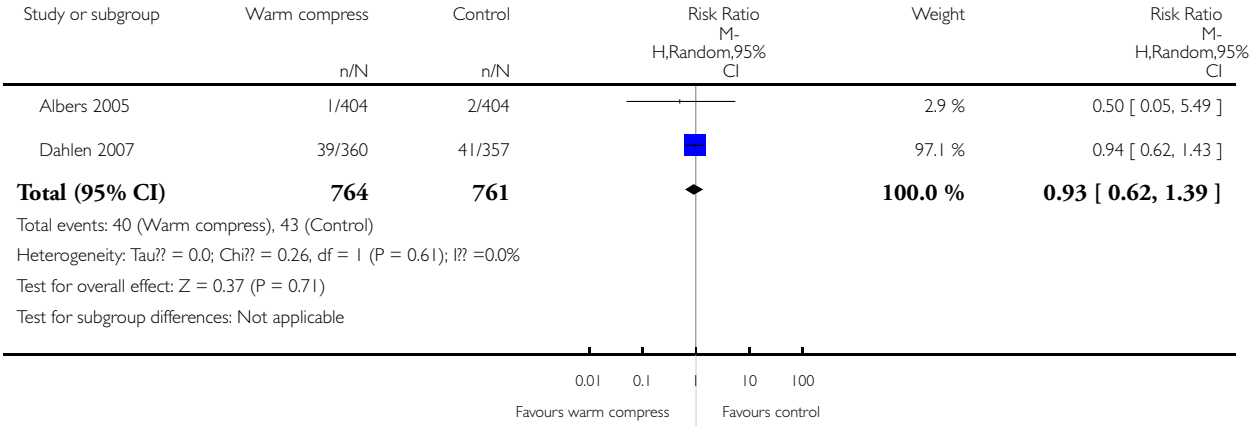


Analysis 2.2. Comparison 2 Warm compresses versus control (hands off or no warm compress), Outcome 2 Episotomy.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 2 Warm compresses versus control (hands off or no warm compress)

Outcome: 2 Episotomy

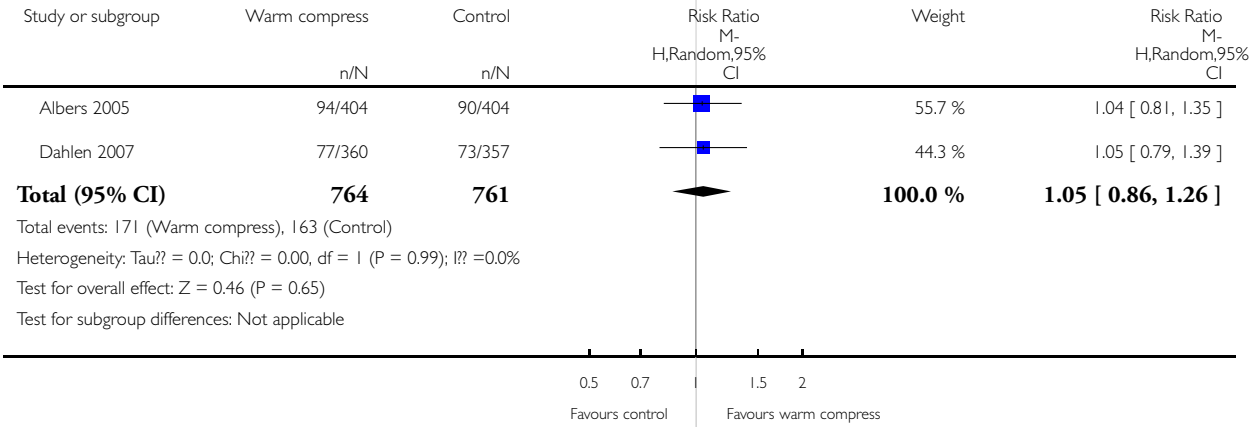


Analysis 2.3. Comparison 2 Warm compresses versus control (hands off or no warm compress), Outcome 3 Intact perineum.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 2 Warm compresses versus control (hands off or no warm compress)

Outcome: 3 Intact perineum



Analysis 3.1. Comparison 3 Massage versus control (hands off or care as usual), Outcome 1 3^{rd} or 4^{th} degree tears.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 3 Massage versus control (hands off or care as usual)

Outcome: 1 3^{rd} or 4^{th} degree tears

Study or subgroup	Massage n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Albers 2005	5/403	6/404		25.2 %	0.84 [0.26, 2.72]
Stamp 2001	12/708	24/632		74.8 %	0.45 [0.23, 0.89]
Total (95% CI)	**1111**	**1036**		**100.0 %**	**0.52 [0.29, 0.94]**

Total events: 17 (Massage), 30 (Control)

Heterogeneity: Tau?? = 0.0; Chi?? = 0.81, df = 1 (P = 0.37); I?? =0.0%

Test for overall effect: Z = 2.15 (P = 0.032)

Test for subgroup differences: Not applicable

Analysis 3.2. Comparison 3 Massage versus control (hands off or care as usual), Outcome 2 Episiotomy.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 3 Massage versus control (hands off or care as usual)

Outcome: 2 Episiotomy

Study or subgroup	Massage n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Albers 2005	7/403	2/404		32.4 %	3.51 [0.73, 16.79]
Stamp 2001	176/708	170/632		67.6 %	0.92 [0.77, 1.11]
Total (95% CI)	**1111**	**1036**		**100.0 %**	**1.42 [0.42, 4.87]**

Total events: 183 (Massage), 172 (Control)

Heterogeneity: Tau?? = 0.57; Chi?? = 2.77, df = 1 (P = 0.10); I?? =64%

Test for overall effect: Z = 0.56 (P = 0.57)

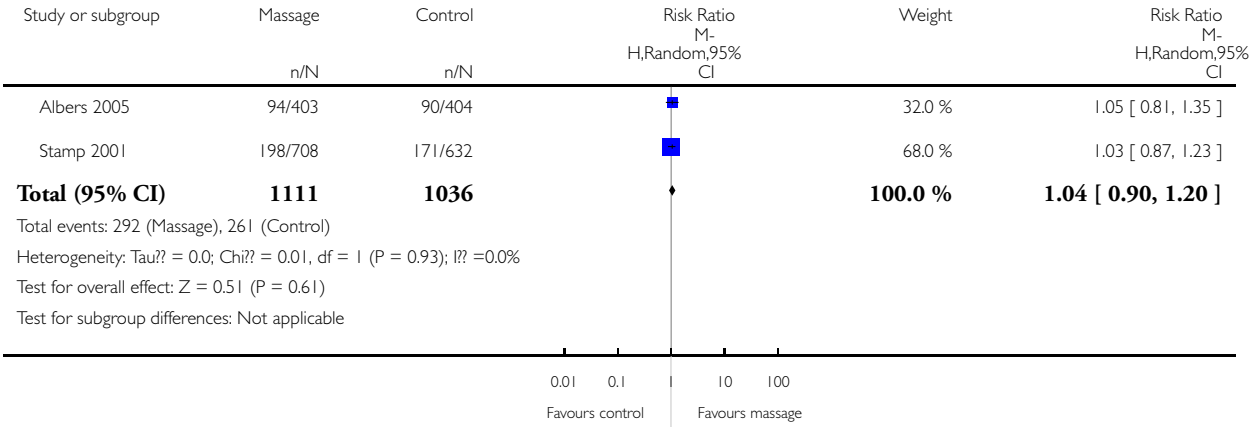
Test for subgroup differences: Not applicable

Analysis 3.3. Comparison 3 Massage versus control (hands off or care as usual), Outcome 3 Intact perineum.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 3 Massage versus control (hands off or care as usual)

Outcome: 3 Intact perineum

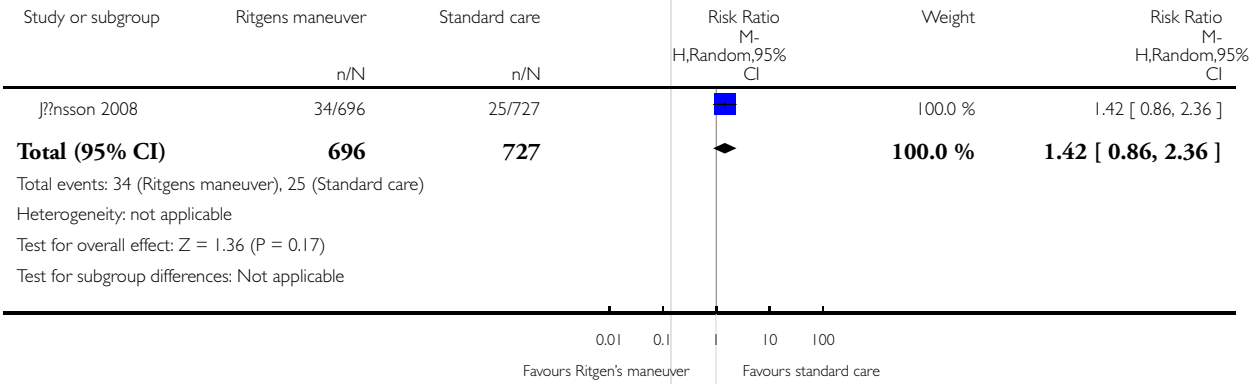


Analysis 4.1. Comparison 4 Ritgen's manoeuvre versus standard care, Outcome 1 3rd degree tears.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 4 Ritgen's manoeuvre versus standard care

Outcome: 1 3rd degree tears



Analysis 4.2. Comparison 4 Ritgen's manoeuvre versus standard care, Outcome 2 4^{th} degree tears.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 4 Ritgen's manoeuvre versus standard care

Outcome: 2 4^{th} degree tears

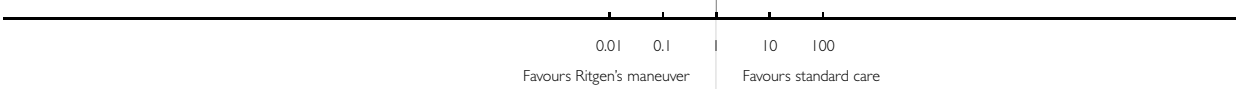
Study or subgroup	Ritgens maneuver n/N	Standard care n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
J??nsson 2008	4/696	7/727		100.0 %	0.60 [0.18, 2.03]
Total (95% CI)	**696**	**727**		**100.0 %**	**0.60 [0.18, 2.03]**

Total events: 4 (Ritgens maneuver), 7 (Standard care)

Heterogeneity: not applicable

Test for overall effect: Z = 0.83 (P = 0.41)

Test for subgroup differences: Not applicable



Analysis 4.3. Comparison 4 Ritgen's manoeuvre versus standard care, Outcome 3 3^{rd} or 4^{th} degree tears.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 4 Ritgen's manoeuvre versus standard care

Outcome: 3 3^{rd} or 4^{th} degree tears

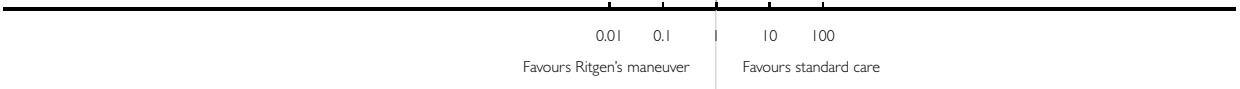
Study or subgroup	Ritgens maneuver n/N	Standard care n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
J??nsson 2008	38/696	32/727		100.0 %	1.24 [0.78, 1.96]
Total (95% CI)	**696**	**727**		**100.0 %**	**1.24 [0.78, 1.96]**

Total events: 38 (Ritgens maneuver), 32 (Standard care)

Heterogeneity: not applicable

Test for overall effect: Z = 0.92 (P = 0.36)

Test for subgroup differences: Not applicable

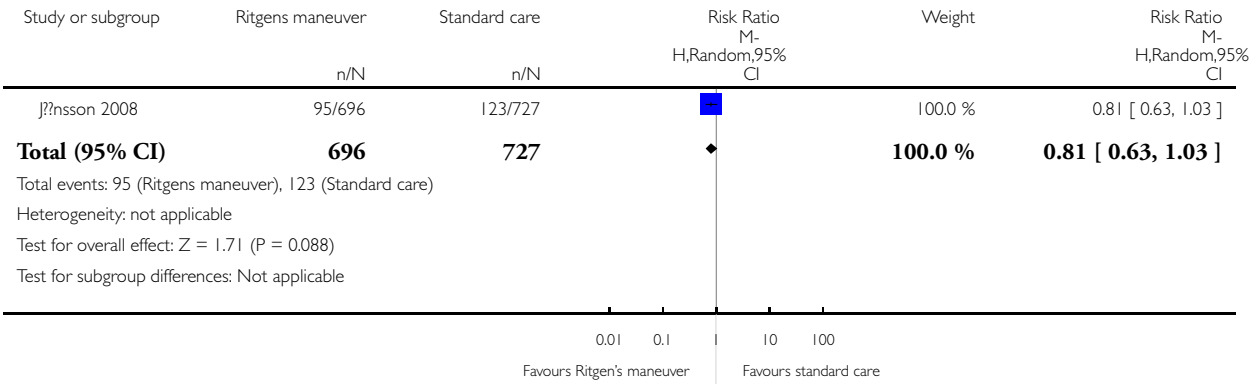


Analysis 4.4. Comparison 4 Ritgen's manoeuvre versus standard care, Outcome 4 Episiotomy.

Review: Perineal techniques during the second stage of labour for reducing perineal trauma

Comparison: 4 Ritgen's manoeuvre versus standard care

Outcome: 4 Episiotomy



APPENDICES

Appendix 1. CENTRAL search strategy

#1 trauma or injur* or lacerat* or tear* or damage* or rupture* or episiotom*
#2 perine*
#3 support* or protect* or hand* or pressure* or manage* or palpat* or technique*
#4 (#1 AND #2 AND #3)

Appendix 2. MEDLINE search strategy

1. exp Labor, Obstetric/
2. exp Delivery, Obstetric/
3. (labor or labour or birth or childbirth).tw.
4. 1 or 2 or 3
5. Perineum/in [Injuries]
6. *Lacerations/
7. (trauma or injur$ or lacerat$ or tear$ or damage$ or rupture$ or episiotom$).mp.
8. perine$.mp.
9. (support$ or protect$ or hand* or pressure or manage$ or palpat$ or technique$).tw.
10. 7 and 8
11. 10 or 6 or 5
12. 11 and 4 and 9

Appendix 3. CINAHL search strategy

1. exp childbirth/
2. exp labor/
3. (labor or labour or birth or childbirth).tw.
4. 1 or 2 or 3
5. Perineum/in [Injuries]
6. "Tears and Lacerations"/
7. (trauma or injur$ or lacerat$ or tear$ or damage$ or episiotom$ or rupture$).mp.
8. perine$.mp.
9. (support$ or protect$ or hand$ or pressure or manage$ or technique$ or palpat$).tw.
10. 7 and 8
11. 5 or 6 or 10
12. 4 and 11 and 9

WHAT'S NEW

Last assessed as up-to-date: 31 October 2011.

Date	Event	Description
11 January 2012	Amended	Corrected citation.

HISTORY

Protocol first published: Issue 3, 2007

Review first published: Issue 12, 2011

Date	Event	Description
16 December 2011	Amended	Contact details edited.
20 September 2008	Amended	Converted to new review format

CONTRIBUTIONS OF AUTHORS

All three review authors (V Aasheim, ABV Nilsen and M Lukasse) worked collaboratively on the development of the protocol and the review. Liv Merete Reinar guided the other three authors in the development of the protocol and review.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- Norwegian Health Service Research Center, Norway.
- Bergen University College, Faculty of Health and Social Sciences, Department of Postgraduate Studies, Norway.
- Rikshospitalet University Hospital, Department of Obstetrics and Gynecology, Norway.

External sources

- No sources of support supplied

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The methods have been updated to reflect the latest Cochrane Handbook (Higgins 2011).

INDEX TERMS

Medical Subject Headings (MeSH)

*Labor Stage, Second; Anal Canal [*injuries]; Delivery, Obstetric [*methods]; Episiotomy [adverse effects; utilization]; Hot Temperature [therapeutic use]; Lacerations [*prevention & control]; Massage; Obstetric Labor Complications [*prevention & control]; Perineum [*injuries]

MeSH check words

Female; Humans; Pregnancy