

Acupuncture for induction of labour (Review)

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[Intervention Review]

Acupuncture for induction of labour

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Editorial group: Cochrane Pregnancy and Childbirth Group.

Publication status and date: Edited (no change to conclusions), published in Issue 1, 2009.

Review content assessed as up-to-date: 30 January 2008.

Citation: Smith CA, Crowther CA. Acupuncture for induction of labour. *Cochrane Database of Systematic Reviews* 2004, Issue 1. Art. No.: CD002962. DOI: 10.1002/14651858.CD002962.pub2.

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ABSTRACT

Background

This is one of a series of reviews of methods of cervical ripening and labour induction using standardised methodology. The use of complementary therapies is increasing and some women look to complementary therapies during pregnancy and childbirth to be used alongside conventional medical practice. Acupuncture involves the insertion of very fine needles into specific points of the body. The limited observational studies to date suggest acupuncture for induction of labour appears safe, has no known teratogenic effects, and may be effective. The evidence regarding the clinical effectiveness of this technique is limited.

Objectives

To determine the effects of acupuncture for third trimester cervical ripening or induction of labour.

Search strategy

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (January 2008), the Cochrane Complementary Medicine Field's Trials Register (*The Cochrane Library* 2007, Issue 4), AMED (1985 to November 2007), MEDLINE (1966 to November 2007), EMBASE (1980 to November 2007), Dissertation Abstracts (1861 to November 2007), CINAHL (1982 to November 2007), the UK National Research Register, (November 2007) and the Australian Clinical Trials Registry (November 2007) and bibliographies of relevant papers.

Selection criteria

Clinical trials comparing acupuncture used for third trimester cervical ripening or labour induction with placebo/no treatment or other methods listed above it on a predefined list of labour induction methods.

Data collection and analysis

A strategy was developed to deal with the large volume and complexity of trial data relating to labour induction. This involved a two-stage method of data extraction.

Main results

Three trials (212 women) were included in the review. Fewer women receiving acupuncture required use of induction methods (RR 1.45, 95% CI 1.08 to 1.95) compared with standard care (147 women, relative risk 1.45, 95% confidence interval 1.08 to 1.95). There were no differences between groups in the reporting of other outcomes.

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Authors' conclusions

There is a need for well-designed randomised controlled trials to evaluate the role of acupuncture to induce labour and for trials to assess clinically meaningful outcomes.

PLAIN LANGUAGE SUMMARY

Acupuncture for induction of labour

There is insufficient evidence describing the efficacy of acupuncture to induce labour.

Induction of labour (getting labour started artificially) is common when the pregnancy is posing a greater risk to the pregnant woman or her unborn child. Acupuncture is the insertion of fine needles into specific energy points of the body and has been used to help induce labour and reduce labour pains. The review included three trials involving 212 women. The evidence regarding the clinical effectiveness of this technique is limited, although small studies suggest women receiving acupuncture compared to standard obstetric care received fewer methods of induction. More research is needed.

BACKGROUND

Sometimes it is necessary to bring on labour artificially because of safety concerns for the mother or baby. This review is one of a series of reviews of methods of labour induction using a standardised protocol. For more detailed information on the rationale for this methodological approach, please refer to the currently published 'generic' protocol (Hofmeyr 2000). The generic protocol describes how a number of standardised reviews will be combined to compare various methods of preparing the cervix of the uterus and inducing labour.

In recent years the use of alternative and complementary medicine has become popular in many Western countries (MacLennan 2002). In Europe, between 12% and 19% of the population report using acupuncture, according to consumer surveys (Fisher 1994). Some women look to alternative therapies during pregnancy and childbirth to be used alongside conventional medical practice. A recent survey described the prevalence and use of complementary therapies among 82 nurse-midwives in North Carolina (Allaire 2000). Almost 20% of nurse-midwives reported use of acupuncture during pregnancy, with 6% of responders specifically recommending its use to ripen the cervix (the process of softening and dilating the cervix) and/or induce labour. In the same survey 27 respondents (33%) reported using herbal therapies for labour stimulation. For some women with a prolonged pregnancy, an induction of labour may be perceived to intervene in the natural process of pregnancy and may drastically change their expected plan of care during pregnancy. The reasons why pregnant women are

interested in using complementary therapies to ripen the cervix and/or induce labour is an important question and needs to be answered when evaluating new options of care.

Acupuncture has been used for more than two thousand years in China and Japan. The diagnosis and treatment prescribed by traditional Chinese medicine (TCM) is influenced by the systems of medicine and philosophy of ancient China. Acupuncture involves the insertion of fine needles into the skin and underlying tissues at precise points on the body. The needle can be left alone or stimulated by turning in various ways or stimulated by electricity. Electro-acupuncture involves the use of electricity to stimulate the acupuncture point. To do this a needle is inserted and a terminal is attached to the handle, the other terminal is connected to a second needle or neutral electrode. Over time different styles of acupuncture are practiced by acupuncturists.

In parts of Europe and Asia acupuncture has been described as a method to alleviate labour pains, and ripen the cervix. More recently it has been used to stimulate the onset of labour. There is a dearth of scientific studies on the use of acupuncture to stimulate labour.

There are three case series that document the role of acupuncture for the induction of labour (Tsuei 1974; Yip 1976; Tsuei 1977). Induction of labour using electro-acupuncture has been reported by Yip 1976. Labour was successfully induced in 21 of the 31 women, with pregnancy duration ranging from 38 to 42 weeks.

The pattern of uterine activity was similar to that of normal labour. In a second study acupuncture with and without electrical stimulation was used to induce labour in 12 pregnant women with a gestational age from 19 to 43 weeks (Tsuei 1974). The success rate was 83% and average induction to delivery time was 13.1 hours. In the third study, 34 term and post term women and seven women with an intrauterine fetal death were induced using electro-acupuncture. Labour was successfully induced in 32 (78%) women (Tsuei 1977). The limited observational studies to date suggest acupuncture for induction of labour appears safe, has no known teratogenic effects, and may be effective. The evidence regarding the clinical effectiveness of this technique is limited.

Two non randomised trials have examined whether acupuncture could initiate contractions in women at term (Theobald 1973; Kubista 1975). In the trial by Theobald (Theobald 1973) four electrodes were applied to the skin of the abdomen to induce labour in the treatment group. Treatment was given to 27 women and compared with 102 women who were controls. In the treatment group 20 (77%) women gave birth on or up to four days before the estimated date of confinement, compared with 47 (46%) in the control group. In the second trial, electro-acupuncture was administered to 35 women, and 35 women received no electro-acupuncture. An increase in the intensity of labour contraction frequency was observed in 31 women in the treatment group. In the control group no increase in labour activity was observed (Kubista 1975).

The mechanism underlying acupuncture to induce labour is speculative at this stage but may involve stimulation of the uterus by hormonal changes or by the nervous system. In animal studies low frequency electrical stimulation of the neuro-hypophyseal system induces the secretion of oxytocin. Parasympathetic stimulation close to term has been shown to have an influence on the uterus (Bell 1972). Stimulation of acupuncture points is known to increase the discharge of thalamic nuclei and the hypothalamic anterior pituitary system (Liao 1979). It is hypothesised that acupuncture neuronal stimulation may increase uterine contractility either by central oxytocin release or by parasympathetic stimulation of the uterus (Tempfeer 1998) without influencing locally active factors such as IL-8 and PGF2 either by central oxytocin release or by parasympathetic stimulation of the uterus (Tempfeer 1998).

Consumers generally perceive complementary medicine to be more natural than conventional medicine and have fewer concerns about side effects. There are reports in the literature of rare adverse reactions to acupuncture, for example pneumothorax, infection or cardiac injury (Yamashita 1999). The general advice for the treatment of conditions arising during pregnancy is to exercise caution particularly during the first trimester of pregnancy, and to avoid some acupuncture points which may stimulate uterine activity. Treatment during the third trimester of pregnancy is thought to carry a lower risk.

This review is one of a series of reviews of methods of labour induction using a standardised protocol. For more detailed information on the rationale for this methodological approach please refer to the currently published protocol (Hofmeyr 2000).

OBJECTIVES

To determine, from the best available evidence, the effectiveness and safety of acupuncture for third trimester cervical ripening and induction of labour.

METHODS

Criteria for considering studies for this review

Types of studies

Clinical trials comparing acupuncture for cervical ripening or labour induction, with placebo/no treatment or other methods listed above it on a predefined list of methods of labour induction (see 'Methods of the review'); the trials included some form of random allocation to either group; and they reported one or more of the pre-stated outcomes.

The control group in a trial of acupuncture can involve sham (mock) acupuncture where the needles are inserted away from the usual location, with the depth and needle stimulation being the same. Or alternatively, minimal acupuncture which involves needles being inserted away from the usual location, with very shallow needling and very slight stimulation, or the use of the placebo needle (Streitberger 1998).

Types of participants

Pregnant women due for third trimester induction of labour, carrying a viable fetus.

Predefined sub-group analyses were (see list below): previous caesarean section or not; nulliparity or multiparity; membranes intact or ruptured, and cervix unfavourable, favourable or undefined. Other subgroup analyses will examine the effects of different styles of acupuncture (for example classical/traditional acupuncture versus single point therapy, or auricular acupuncture), as well as the type of control group. Only those outcomes with data will appear in the analysis tables.

Types of interventions

Acupuncture compared with placebo/no treatment or any other method above it on a predefined list of methods of labour induction.

Types of outcome measures

Clinically relevant outcomes for trials of methods of cervical ripening/labour induction have been prespecified by two authors of labour induction reviews (Justus Hofmeyr and Zarko Alfirevic). Differences were settled by discussion.

Five primary outcomes were chosen as being most representative of the clinically important measures of effectiveness and complications. Sub-group analyses will be limited to the primary outcomes:

- (1) vaginal delivery not achieved within 24 hours;
- (2) uterine hyperstimulation with fetal heart rate (FHR) changes;
- (3) caesarean section;
- (4) serious neonatal morbidity or perinatal death (e.g. seizures, birth asphyxia defined by trialists, neonatal encephalopathy, disability in childhood);
- (5) serious maternal morbidity or death (e.g. uterine rupture, admission to intensive care unit, septicaemia).

Perinatal and maternal morbidity and mortality are composite outcomes. This is not an ideal solution because some components are clearly less severe than others. It is possible for one intervention to cause more deaths but less severe morbidity. However, in the context of labour induction at term this is unlikely. All these events will be rare, and a modest change in their incidence will be easier to detect if composite outcomes are presented. The incidence of individual components will be explored as secondary outcomes (see below).

Secondary outcomes relate to measures of effectiveness, complications and satisfaction:

Measures of effectiveness:

- (6) cervix unfavourable/unchanged after 12 to 24 hours;
- (7) oxytocin augmentation.

Complications:

- (8) uterine hyperstimulation without FHR changes;
- (9) uterine rupture;
- (10) epidural analgesia;
- (11) instrumental vaginal delivery;
- (12) meconium stained liquor;
- (13) Apgar score less than seven at five minutes;
- (14) neonatal intensive care unit admission;
- (15) neonatal encephalopathy;
- (16) perinatal death;
- (17) disability in childhood;
- (18) maternal side-effects (all);
- (19) maternal nausea;
- (20) maternal vomiting;
- (21) maternal diarrhoea;
- (22) other maternal side-effects;
- (23) postpartum haemorrhage (as defined by the trial authors);
- (24) serious maternal complications (e.g. intensive care unit admission, septicaemia but excluding uterine rupture);
- (25) maternal death.

Measures of satisfaction:

(26) woman not satisfied;

(27) caregiver not satisfied.

Acupuncture specific outcomes:

- (28) use of other induction methods;
- (29) time from trial intervention to the birth of the baby;
- (30) length of labour.

While all the above outcomes were sought, only those with data appear in the analysis tables.

The terminology of uterine hyperstimulation is problematic (Curtis 1987). In the reviews we will use the term 'uterine hyperstimulation without FHR changes' to include uterine tachysystole (more than 5 contractions per 10 minutes for at least 20 minutes) and uterine hypersystole/hypertonus (a contraction lasting at least two minutes) and 'uterine hyperstimulation with FHR changes' to denote uterine hyperstimulation syndrome (tachysystole or hypersystole with fetal heart rate changes such as persistent decelerations, tachycardia or decreased short term variability).

Outcomes were included in the analysis: if reasonable measures were taken to minimise observer bias; data were available for analysis according to original allocation; and loss to follow up was less than 20%.

Search methods for identification of studies

Electronic searches

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register by contacting the Trials Search Co-ordinator (January 2008).

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. weekly searches of MEDLINE;
3. handsearches of 30 journals and the proceedings of major conferences;
4. weekly current awareness alerts for a further 44 journals plus monthly BioMed Central email alerts.

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

Trials identified through the searching activities described above are assigned to a review topic (or topics). The Trials Search Co-ordinator searches the register for each review using the topic list rather than keywords.

The initial search was performed simultaneously for all reviews of methods of inducing labour, as outlined in the generic protocol for these reviews (Hofmeyr 2000).

We also undertook additional searches of the Complementary Medicine Field's Trials Register (*The Cochrane Library* 2007, Issue 4), AMED (1985 to November 2007), MEDLINE (1966 to November 2007), EMBASE (1980 to November 2007), Dissertation Abstracts (1861 to November 2007), CINAHL (1982 to November 2007), the UK National Research Register (<http://www.nrr.nhs.uk/>) (November 2007) and the Australian Clinical Trials Registry (<http://www.ctc.usyd.edu.au/trials/registry/registry.htm>) (November 2007). We used the search terms acupuncture, electro acupuncture, TENS, induction of labour.

Searching other resources

We searched reference lists of trial reports and reviews by hand. We did not apply any language restrictions.

Data collection and analysis

A strategy has been developed to deal with the large volume and complexity of trial data relating to labour induction. Many methods have been studied, in many different categories of women undergoing labour induction. Most trials are intervention-driven, comparing two or more methods in various categories of women. Clinicians and parents need the data arranged by category of woman, to be able to choose which method is best for a particular clinical scenario. To extract these data from several hundred trial reports in a single step would be very difficult. We have therefore developed a two-stage method of data extraction. The initial data extraction was done in a series of primary reviews arranged by methods of induction of labour, following a standardised methodology. The data was then be extracted from the primary reviews into a series of secondary reviews, arranged by category of woman. To avoid duplication of data in the primary reviews, the labour induction methods have been listed in a specific order, from one to 25. Each primary review includes comparisons between one of the methods (from two to 25) with only those methods above it on the list. Thus, the review of intravenous oxytocin (4) will include only comparisons with intracervical prostaglandins (3), vaginal prostaglandins (2) or placebo (1). Methods identified in the future will be added to the end of the list. The current list is as follows:

1. placebo/no treatment;
2. vaginal prostaglandins (Kelly 2003);
3. intracervical prostaglandins (Boulvain 2008);
4. intravenous oxytocin (Kelly 2001b);
5. amniotomy (Bricker 2000);
6. intravenous oxytocin with amniotomy (Howarth 2001);
7. vaginal misoprostol (Hofmeyr 2003);
8. oral misoprostol (Alfirevic 2006);

9. mechanical methods including extra-amniotic Foley catheter (Boulvain 2001);
10. membrane sweeping (Boulvain 2005);
11. extra-amniotic prostaglandins (Hutton 2001);
12. intravenous prostaglandins (Luckas 2000);
13. oral prostaglandins (French 2001);
14. mifepristone (Neilson 2000);
15. estrogens (Thomas 2001);
16. corticosteroids (Kavanagh 2006);
17. relaxin (Kelly 2001c);
18. hyaluronidase (Kavanagh 2006a);
19. castor oil, bath, and/or enema (Kelly 2001);
20. acupuncture;
21. breast stimulation (Kavanagh 2005);
22. sexual intercourse (Kavanagh 2001);
23. homoeopathic methods (Smith 2003);
24. nitric oxide (Kelly 2008);
25. buccal or sublingual misoprostol (Muzonzini 2004).

The primary reviews will be analysed by the following subgroups:

1. previous caesarean section or not;
2. nulliparity or multiparity;
3. membranes intact or ruptured;
4. cervix favourable, unfavourable or undefined.

The secondary reviews will include all methods of labour induction for each of the categories of women for which subgroup analysis has been done in the primary reviews, and will include only five primary outcome measures. There will thus be six secondary reviews, of methods of labour induction in the following groups of women:

1. nulliparous, intact membranes (unfavourable cervix, favourable cervix, cervix not defined);
2. nulliparous, ruptured membranes (unfavourable cervix, favourable cervix, cervix not defined);
3. multiparous, intact membranes (unfavourable cervix, favourable cervix, cervix not defined);
4. multiparous, ruptured membranes (unfavourable cervix, favourable cervix, cervix not defined);
5. previous caesarean section, intact membranes (unfavourable cervix, favourable cervix, cervix not defined);
6. previous caesarean section, ruptured membranes (unfavourable cervix, favourable cervix, cervix not defined).

Each time a primary review is updated with new data, those secondary reviews which include data which have changed, will also be updated.

The trials included in the primary reviews were extracted from an initial set of trials covering all interventions used in induction of labour (*see* above for details of search strategy). The data extraction process was conducted centrally. This was co-ordinated from the Clinical Effectiveness Support Unit (CESU) at the Royal College of Obstetricians and Gynaecologists, UK, in co-operation with the Pregnancy and Childbirth Group of the Cochrane Collaboration. This process allowed the data extraction process to be standardised

across all the reviews.

The trials were initially reviewed on eligibility criteria, using a standardised form and the basic selection criteria specified above. Following this, data were extracted to a standardised data extraction form which was piloted for consistency and completeness. The pilot process involved the researchers at the CESU and previous reviewers in the area of induction of labour.

Information is extracted regarding the methodological quality of trials on a number of levels. This process is completed without consideration of trial results. Assessment of selection bias examines the process involved in the generation of the random sequence and the method of allocation concealment separately. These are then judged as adequate or inadequate using the criteria described in Table 1 for the purpose of the reviews.

Performance bias was examined with regards to whom was blinded in the trials i.e. patient, caregiver, outcome assessor or analyst. In many trials the caregiver, assessor and analyst were the same party. Details of the feasibility and appropriateness of blinding at all levels were sought.

Individual outcome data are included in the analysis if they meet the pre-stated criteria in 'Types of outcome measures'. Included trial data were processed as described in the Cochrane Reviewers' Handbook (Higgins 2006). Data extracted from the trials were analysed on an intention to treat basis (when this was not done in the original report, re-analysis was performed if possible). Where data were missing, clarification was sought from the original authors. If the attrition was such that it might significantly affect the results, these data were excluded from the analysis. This decision rests with the reviewers of primary reviews and was clearly documented. Once missing data become available, they will be included in the analyses.

Data were extracted from all eligible trials to examine how issues of quality influence effect size in a sensitivity analysis. In trials where reporting was poor, methodological issues were reported as unclear or clarification sought. C Smith and C Crowther extracted the data for this update.

Once the data were extracted, they were distributed to individual reviewers for entry onto the Review Manager computer software (RevMan 2000), checked for accuracy, and analysed as above using the RevMan software. For dichotomous data, relative risks and 95% confidence intervals are calculated, and in the absence of heterogeneity, results are pooled using a fixed effects model.

The predefined criteria for sensitivity analysis include all aspects of quality assessment as mentioned above, including aspects of selection, performance and attrition bias.

Primary analysis is limited to the prespecified outcomes and subgroup analyses. In the event of differences in unspecified outcomes or subgroups being found, these are analysed post hoc, but clearly identified as such to avoid drawing unjustified conclusions.

RESULTS

Description of studies

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#); [Characteristics of ongoing studies](#).

The search found fourteen studies. Three trials are included (Rabl 2001; Gaudernack 2006; Harper 2006). Seven trials were excluded (Bo 2006; Dunn 1989; Dorr 1990; Martinez 2004; Romer 2000; So 1979; Tremeau 1992). Three trials are ongoing (Lorentzen 2006; Modlock 2006; Smith 2000) and one is awaiting classification (Coeytaux 2007).

Included studies

A trial undertaken in Austria compared acupuncture and no acupuncture in a single-blind randomised controlled trial, involving 56 women (Rabl 2001). The authors of the trial examined the efficacy of acupuncture on cervical ripening for induction of labour and the need for a postdate induction among 56 women. The trial outcomes were: change in cervical length over time; the time from the first fibronectin test to birth; the time from estimated date of confinement to delivery; the number of postdate inductions; duration of first and second stage of labour and the overall duration of labour; the need for oxytocin augmentation; and the mode of birth. Women allocated to the treatment group received one single session of acupuncture on the estimated date of confinement with two acupuncture points stimulated bilaterally and retained for 20 minutes.

A randomised controlled trial undertaken by Gaudernack 2006 randomised 100 women to the trial, undertaken at a University hospital in Oslo, Norway. The trial commenced in April 2003 and was completed in February 2005, and compared acupuncture to standard care. All women in the acupuncture group received stimulation of three acupuncture points Stomach 36 (ST36), Liver 3 (LR3), and Conception Vessel 4 (CV4). In addition, a Chinese medicine diagnosis was undertaken and additional acupuncture points were administered. These included Three Heater 6 (TE6), Large Intestine 4 (LI4), Gall Bladder 41 (GB41), Kidney 6 (KI6), Spleen 6 (SP6), Heart 7 (HT7), and Lung 7 (LU7). Treatment was administered over 20 minutes. The primary outcome was duration of labour.

Harper 2006 undertook a trial of 56 nulliparous women, between July 2004 and February 2005. The trial compared acupuncture to standard care, and randomised women at 39 4/7 weeks at an outpatient clinical setting at The University of North Carolina, USA. Acupuncture was administered on three out of four consecutive days beginning on the day of enrolment. Acupuncture was administered by a licensed acupuncturist trained in traditional Chinese medicine. Acupuncture involved the insertion of eight needles 0.2-0.25 x 25-75 mm acupuncture needles into bilateral points: Large Intestine 4 (LI4), Spleen 6 (SP6), Bladder 31 (UB31), Bladder 32 (UB32). Needles were inserted to a depth of 5-50 mm. Electro-

acupuncture was applied to UB 31 and 32 with current at 2Hz during the 30 minute treatment. Following insertion needles were left in place for 30 minutes. The primary outcome was time from randomisation to birth. Secondary outcomes included mode of delivery, onset of spontaneous labour, and neonatal complications.

Excluded studies

The study by [Dunn 1989](#) included 20 women with postdate pregnancies, and was excluded from the review because no clinically relevant outcomes were reported from this trial. This trial demonstrated that contractions can be induced in postdate pregnant women using transcutaneous electrical stimulation at peripheral acupuncture points ([Dunn 1989](#)). However, the trial was not designed to assess whether women proceeded to labour and no clinically relevant outcomes were reported in the study.

The trial by [Dorr 1990](#), undertaken in Czechoslovakia, recruited 16 women with a pregnancy between 39 to 43 weeks. The trial was excluded because the trial was a clinical controlled trial. One group received acupuncture after the discharge of amniotic fluid (up to four hours); the second group received acupuncture stimulation six or more hours after the discharge of amniotic fluid.

The trial by [Tremeau 1992](#), recruited 98 women, was excluded from the review because this trial is primarily an assessment of acupuncture's role with ripening the cervix. The primary outcome of change in Bishops score from trial entry to 48 hours after the final treatment (nine days) was not clinically relevant to this systematic review.

The trial by ([Romer 2000](#)) recruited 878 primiparous women to receive acupuncture, placebo acupuncture or no acupuncture from 36 weeks' gestation. Women were recruited at a university hospital in Germany. The primary outcomes reported change in Bishops score from trial entry, length of cervix and duration of labour and were not relevant to this systematic review.

The study by [Bo 2006](#) reported on the use of scalp acupuncture to provide pain relief in labour only. No outcomes on induction of labour were reported.

The study by [Martinez 2004](#) compared women receiving acupuncture to women receiving standard care. Fifty pregnant women at term were randomised in a tertiary hospital. The trial examined the effect of acupuncture (point Spleen 6) could produce or enhance uterine contractions. The trial did not report on any outcomes relevant to this review.

The clinical controlled trial reported by [So 1979](#) was undertaken at a hospital in Hong Kong. Sixty women were allocated to three groups: electro-acupuncture (stimulation of Spleen 6 and Colon 4); acupuncture at these same points on one side of the body only; and thirdly, sham acupuncture. No data were available on the results of the trial.

Risk of bias in included studies

Allocation concealment

The trials of acupuncture were coded A ([Gaudernack 2006](#); [Harper 2006](#); [Rabl 2001](#)) with a computer-generated randomisation schedule.

Method of allocation

In the Rabl trial ([Rabl 2001](#)), the allocation sequence was computer generated from a central randomisation service. In the Gaudernack ([Gaudernack 2006](#)) and Harper ([Harper 2006](#)) trials, sealed opaque envelopes were used. It was unclear if the envelopes were sequentially numbered.

Blinding

In the Rabl trial ([Rabl 2001](#)), the care providers were blind to the woman's study group only; participants, the statistician, and personnel who undertook the cervical assessment were not blind to the woman's study group allocation. In the Harper trial ([Harper 2006](#)), the outcome assessor was blind; it was not feasible to blind the subject and therapist, and the status of the analyst was unclear. In the Gaudernack ([Gaudernack 2006](#)) trial, there was performance bias, the subjects and therapist were not blind to group allocation, and the blinding status of the outcome assessor and analyst were unclear.

Intention-to-treat analysis

Two trials did not report on whether an intention-to-treat analysis was undertaken ([Harper 2006](#); [Gaudernack 2006](#)).

Losses to follow up

There were no losses to follow up in the Harper trial ([Harper 2006](#)). In the [Gaudernack 2006](#) trial, five (11.6%) women in the acupuncture group were post-randomisation exclusions and four (8.3%) women in the control group. In the Rabl trial ([Rabl 2001](#)), there were 11 (20%) post-randomisation exclusions and losses to follow up. There was an imbalance in the post-randomisation exclusions (five in the treatment group and eight in the control group). The trial author was unable to provide outcome data on the 11 women who had been excluded from analyses.

Effects of interventions

This Review included three trials of 212 women.

Acupuncture versus standard care

Primary outcomes

Only one study reported on a primary outcome. [Gaudernack 2006](#) found no difference in caesarean section between the acupuncture and standard care (relative risk (RR) 0.43, 95% confidence interval (CI) 0.17 to 1.11, 56 women).

Secondary outcomes

Two trials (147 women) ([Gaudernack 2006](#); [Harper 2006](#)) reported on the use of other induction methods; fewer women receiving acupuncture required use of induction methods (RR 1.45, 95% CI 1.08 to 1.95).

[Harper 2006](#) (56 women) found no difference between acupuncture and standard care in the time from entry to delivery (weighted mean difference (WMD) -21.00, 95% CI -65.42 to 23.42).

[Gaudernack 2006](#) (91 women) found no difference between acupuncture and standard care in the need for epidural analgesia (RR 0.97, 95% CI 0.52 to 1.80), instrumental vaginal delivery (RR 0.52, 95% CI 0.21 to 1.24), oxytocin augmentation (RR 1.26, 95% CI 0.98 to 1.62) and maternal infection (RR 0.37, 95% CI 0.02 to 8.88). There was no difference in Apgar score less than seven at five minutes.

Subsidiary outcomes (not prespecified)

[Gaudernack 2006](#) reported on perineal tear and found no difference between groups (RR 1.32, 95% CI 0.89 to 1.95, 91 women). There was also no difference in fetal infection between groups.

In the Rabl trial ([Rabl 2001](#)), 11 (20%) women were post-randomisation exclusions and proceeded to have an elective induction of labour. In the acupuncture group, labour was induced on one woman because of fetal heart abnormalities and two inductions were performed due to prelabour rupture of membranes. In the control group, two women requested an elective induction of labour, three women received an induction of labour because of prelabour rupture of membranes, and in three women labour was induced due to abnormal fetal heart rate patterns. Because data were not available about the post-randomisation exclusions and an intention-to-treat analysis could not be undertaken, no results could be incorporated into this Review.

DISCUSSION

This review included three trials of 212 women; however, limited data could be included in any meta-analyses.

Evidence from two trials included in the review ([Harper 2006](#); [Gaudernack 2006](#)) suggest women receiving acupuncture required less use of other induction methods compared with women receiving standard care alone.

The trials were of moderate methodological quality and included small trials, or were inadequately reported. The insufficient reporting made the assessment of methodological quality and data

extraction difficult. Overall, the clinical implications of the studies are limited by the inclusion of few clinical outcomes.

Further research is required. Appropriately powered randomised trials are required to examine the effectiveness of acupuncture on the clinical outcomes described in this review. Given the observational data that acupuncture can induce uterine activity, assist with cervical ripening and the knowledge that some women seek acupuncture treatment alongside conventional obstetrics, there is a need for well-designed trials in this area. The three trials of acupuncture represent different approaches to the use of acupuncture to initiate labour. In addition to the style of acupuncture used, acupuncture can vary in the selection of acupuncture points and the needling techniques used (duration of needling, number of points used, depth of needling, type of stimulation and point selection). It is important that any future clinical trials of acupuncture for induction of labour report the basis for the acupuncture treatment and needling as described in the STRICTA guideline ([MacPherson 2001](#)). Trials should report on relevant clinical outcomes.

AUTHORS' CONCLUSIONS

Implications for practice

Acupuncture for induction of labour has not been fully evaluated for safety and effectiveness.

Implications for research

Clinical trial data from small studies and observational data suggest acupuncture may stimulate the onset of labour. There is a need for well-designed, randomised controlled trials to assess whether acupuncture can stimulate labour. There is a need to include all clinically relevant outcomes in future trials. Clinically relevant outcomes in these trial should include those described in this review and consideration be given to:

- the use of other methods of induction such as prostaglandins, oxytocin and artificial rupture of membranes;
- whether vaginal birth is achieved over a longer time period than that expected when using pharmacological agents;
- whether there are any adverse effects arising from acupuncture
- the cost effectiveness of the intervention.

In planning new trials clinical treatment protocols should be based on a comprehensive review of the clinical literature.

ACKNOWLEDGEMENTS

We acknowledge the French to English translation by Peter Smith and the German to English translation by Richmal Oates-Whitehead.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Gaudernack 2006

Methods	Single-blind, randomised controlled trial of acupuncture versus standard care. The trial generated a computer-generated, randomisation schedule. Randomisation was concealed in sealed envelopes. Allocation was undertaken by the midwife. It was not feasible for women and therapist to be blind to group allocation. It was unclear if the outcome assessor and analyst were blind to group allocation. There was no power calculation.	
Participants	100 women were randomised, 48 to the acupuncture group and 52 to the control group. The trial was undertaken in Norway, and included women with a singleton pregnancy, with spontaneous rupture of membranes, cephalic presentation and at term.	
Interventions	The acupuncture intervention included stimulation of acupuncture points Liver 3, Stomach 36, Conception Vessel 4; in addition, acupuncture points were administered according to the Traditional Chinese Medicine (TCM) diagnosis. Needles were retained for 20 minutes. Women in the control group received conventional medical treatment including prostaglandins and/or oxytocin.	
Outcomes	Oxytocin augmentation, use of other induction agents, time from trial intervention to the birth of the baby, epidural analgesia, instrumental vaginal delivery, maternal side effects (infection), bleeding, tears, birth weight and Apgar score <7 at 5 minutes.	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Harper 2006

Methods	Single-blind, randomised controlled trial of acupuncture versus standard care. The trial generated a computer-generated randomisation schedule. Randomisation was concealed in sealed envelopes. Group assignment was made by the principal investigator after entry criteria were confirmed. It was not feasible for women and therapist to be blind to group allocation, it was unclear if the outcome assessor and analyst were blind to group allocation. There was no power calculation.	
Participants	Fifty-six women were randomised to the trial. The trial was undertaken in an outpatient clinic at the University of North Carolina, USA. Women were included if they were primiparous, with a Bishop's score < 7, between 39 and 41 weeks, with a cephalic presentation. Women were excluded if they had a contraindication to vaginal delivery, uncertain dating or an inability to tolerate acupuncture.	

Harper 2006 (Continued)

Interventions	The intervention group involved acupuncture administered for 3 out of 4 consecutive days from the first day of enrolment. A Licensed TCM acupuncturist administered the acupuncture. Acupuncture was administered bilaterally to Colon 4, Spleen 6, Bladder 31 and 32. Electro-acupuncture was administered to the sacrum Bladder 31 and 32 points. Treatment was administered over 30 minutes and no individualised TCM treatment was administered. The control group received routine care (not specified).
Outcomes	Caesarean section, cervical change, time from administration of acupuncture to delivery and spontaneous onset of labour.
Notes	There was complete follow up and a power calculation was performed.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Rabl 2001

Methods	Single-blind, randomised controlled trial. The trial used a central randomisation service, with computer-generated sequence of random numbers. Women were randomised to acupuncture or no acupuncture. The outcome assessors were not blind to group allocation.
Participants	Fifty-six women were randomised to the trial in Austria. Inclusion criteria were EDC confirmed by ultrasound, uncomplicated pregnancy, singleton pregnancy with cephalic presentation. Exclusion criteria were cervical dilatation greater than 3 cm, premature rupture of membranes, previous caesarean section, maternal complications, e.g. pre-eclampsia, fetal growth retardation. Women were randomised at term.
Interventions	All women were examined at term and at two day intervals thereafter. Fetal heart rate was monitored, the cervical length was measured by ultrasound, cervical mucus was obtained for fetal fibronectin test and the cervical status was assessed for the Bishops score. Women received acupuncture at term and at two day intervals thereafter. Acupuncture points - large intestine 4, and spleen 6 were bilaterally inserted. De qi needling sensation was achieved. Needles were left in for 20 minutes. If the woman was undelivered 10 days after her EDC labour was induced. The control group received routine care.
Outcomes	The change in cervical length over time, time from the first fibronectin test to delivery, time period from EDC to time of delivery, number of postdate indications, length of first and second stage of labour, need for oxytocin augmentation and mode of delivery.
Notes	No sample-size calculation. Eleven (20%) women were excluded and follow up data were not available on these women.

Risk of bias

Item	Authors' judgement	Description
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Rabl 2001 (Continued)

Allocation concealment?	Yes	A - Adequate
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EDC: estimated date of confinement

Characteristics of excluded studies [ordered by study ID]

Bo 2006	This study evaluated the role of acupuncture primarily during labour on pain relief. No data on induction outcomes were reported.
Dorr 1990	The evidence regarding the clinical effectiveness of this technique is limited. This controlled clinical trial undertaken in Czechoslovakia consisted of women between 39 to 43 weeks with a cervical score greater than 5 (with no regular uterine contractions). Sixteen women received acupuncture. In one group electrical acupuncture commenced after the discharge of amniotic fluid (up to 4 hours); in the other group, stimulation began 6 or more hours after the discharge of amniotic fluid. Spontaneous vaginal delivery was achieved in 13 women.
Dunn 1989	This comparison between electrical acupuncture stimulation or placebo acupuncture assessed the onset of uterine contractions in 20 postdate pregnant women. There was evidence of strong contractions in the treatment group. There were no clinical outcome data; in particular, the trial did not report on whether women proceeded to spontaneous labour.
Martinez 2004	This randomised controlled trial compared women receiving acupuncture to women receiving standard care. Fifty pregnant women at term were randomised in a tertiary hospital. The trial examined the effect of acupuncture (acupuncture point Spleen 6) could produce or enhance uterine contractions. The trial did not report on any outcomes relevant to this review.
Romer 2000	This trial compared acupuncture with placebo acupuncture and no treatment. Primiparous women were recruited from 36 weeks' gestation and the trial intervention was administered weekly until delivery. The trial reported women receiving acupuncture caused morphologic change at the cervix, and women experienced shorter length of labour. The trial was excluded because it did not report on primary outcomes relevant to cervical ripening and induction of labour.
So 1979	A controlled clinical trial was undertaken at a hospital in Hong Kong. Sixty women were allocated to 3 groups: electro-acupuncture (stimulation of Spleen 6 and Colon 4); acupuncture at these same points on one side of the body only; and thirdly, sham acupuncture. No data were available on the results of the trial.
Tremeau 1992	This clinical trial compared acupuncture with placebo acupuncture or a no acupuncture control group. Women were recruited to the trial at 37 to 38 weeks' gestation with a Bishops score of less than 4. Three treatments were administered and a cervical score assessed at the end of the trial. This trial did not report on the primary clinical outcomes assessed in this review.

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

Lorentzen 2006

Trial name or title	Use of Acupuncture for Stimulation of labour.
Methods	
Participants	150 women with a normal pregnancy, in labour, 37th week or greater, ruptured membranes, with primary or secondary inertia.
Interventions	Acupuncture group with points Kidney 3, Kidney 6, Spleen 6, Bladder 60, Colon 4, Bladder 67 (acupressure)
Outcomes	Primary outcomes: cervical dilatation, secondary outcomes length of labour, use of oxytocin and contractions pr/30 min.
Starting date	October 2002.
Contact information	Iben P Lorentzen, Hernig and Holstebro Hospitals, Denmark.
Notes	

Modlock 2006

Trial name or title	Can acupuncture be used as preparation for induction of labour?
Methods	
Participants	124 women 41+6 weeks, with a normal pregnancy. Exclusion criteria: women not able to understand or speak Danish, multiple pregnancy, in active labour, maternal medical complications, fetal disease, previous complicated delivery.
Interventions	Acupuncture: points not specified or placebo acupuncture at the same points.
Outcomes	Primary outcomes: delivery of baby
Starting date	November 2005.
Contact information	Professor Niels Ulbjerg, Skejby Hospital, Aarhus, 8000, Denmark.
Notes	

Smith 2000

Trial name or title	The influence of acupuncture stimulation on the induction of labour: a randomised controlled trial.
Methods	
Participants	Women with a postdate pregnancy. Women were included if they had a singleton pregnancy and cephalic presentation. Women were excluded if there were any contra-indications to a vaginal delivery, or if there were any signs of active labour, or women with spontaneous rupture of membranes. 404 women will be randomised to the trial.
Interventions	Acupuncture versus control acupuncture. The first treatment was administered 2 days before a planned induction. A second treatment was administered the next day if labour had not begun.
Outcomes	Reduced need for methods of induction of labour, spontaneous onset of labour, time from the start of acupuncture treatment to the delivery of the baby.
Starting date	5/98
Contact information	Caroline Smith Centre for Reproductive Health, The University of Adelaide, AUSTRALIA email caroline.a.smith@adelaide.edu.au
Notes	

DATA AND ANALYSES

Comparison 1. Acupuncture versus standard care

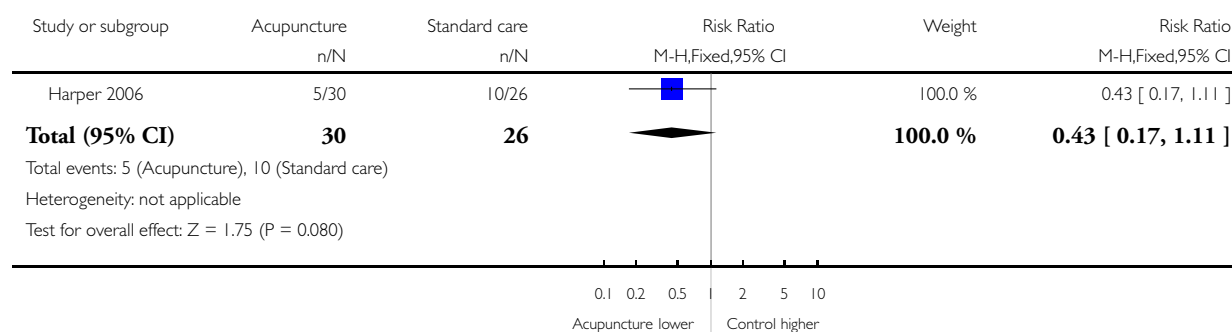
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Caesarean section	1	56	Risk Ratio (M-H, Fixed, 95% CI)	0.43 [0.17, 1.11]
2 Time from trial entry to birth of baby	1	56	Mean Difference (IV, Fixed, 95% CI)	-21.0 [-65.42, 23.42]
3 Need for induction methods	2	147	Risk Ratio (M-H, Fixed, 95% CI)	1.45 [1.08, 1.95]
4 Need for epidural	1	91	Risk Ratio (M-H, Fixed, 95% CI)	0.97 [0.52, 1.80]
5 Instrumental vaginal delivery	1	91	Risk Ratio (M-H, Fixed, 95% CI)	0.52 [0.21, 1.24]
6 Apgar score less than 7	1	91	Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
7 Oxytocin augmentation	1	91	Risk Ratio (M-H, Fixed, 95% CI)	1.26 [0.98, 1.62]
8 Maternal infection	1	91	Risk Ratio (M-H, Fixed, 95% CI)	0.37 [0.02, 8.88]
9 Fetal infection	1	91	Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
10 Perineal tear	1	91	Risk Ratio (M-H, Fixed, 95% CI)	1.32 [0.89, 1.95]

Analysis 1.1. Comparison 1 Acupuncture versus standard care, Outcome 1 Caesarean section.

Review: Acupuncture for induction of labour

Comparison: 1 Acupuncture versus standard care

Outcome: 1 Caesarean section

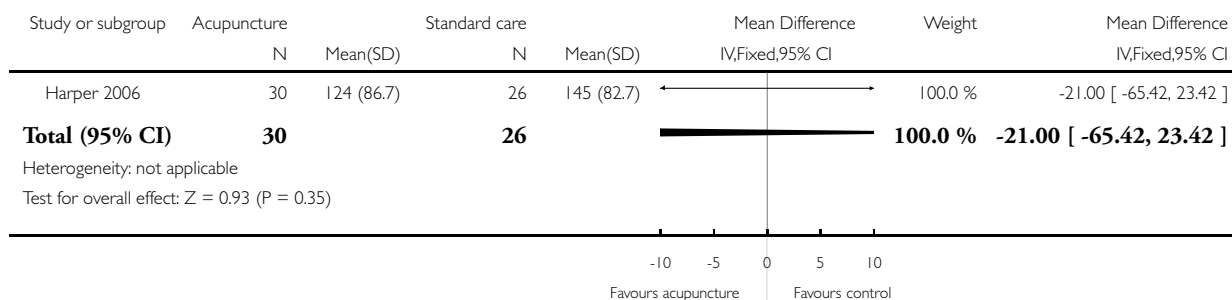


Analysis 1.2. Comparison 1 Acupuncture versus standard care, Outcome 2 Time from trial entry to birth of baby.

Review: Acupuncture for induction of labour

Comparison: 1 Acupuncture versus standard care

Outcome: 2 Time from trial entry to birth of baby

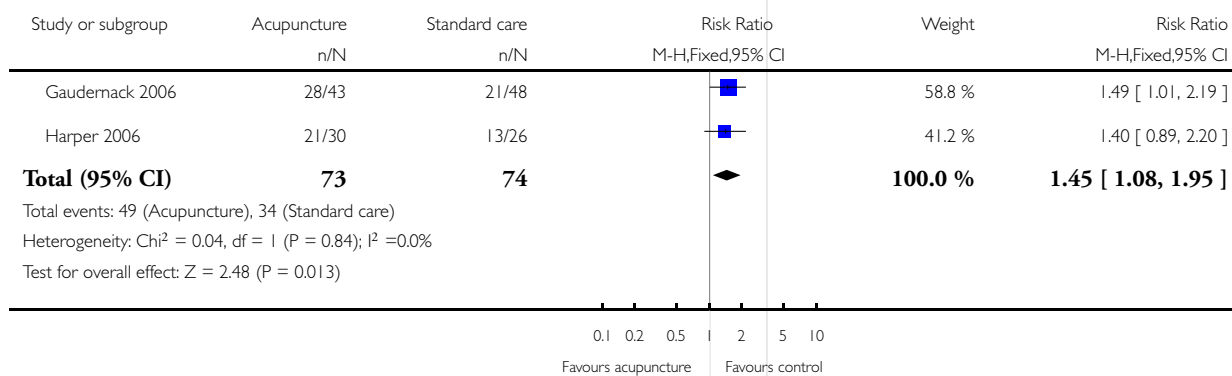


Analysis 1.3. Comparison 1 Acupuncture versus standard care, Outcome 3 Need for induction methods.

Review: Acupuncture for induction of labour

Comparison: 1 Acupuncture versus standard care

Outcome: 3 Need for induction methods

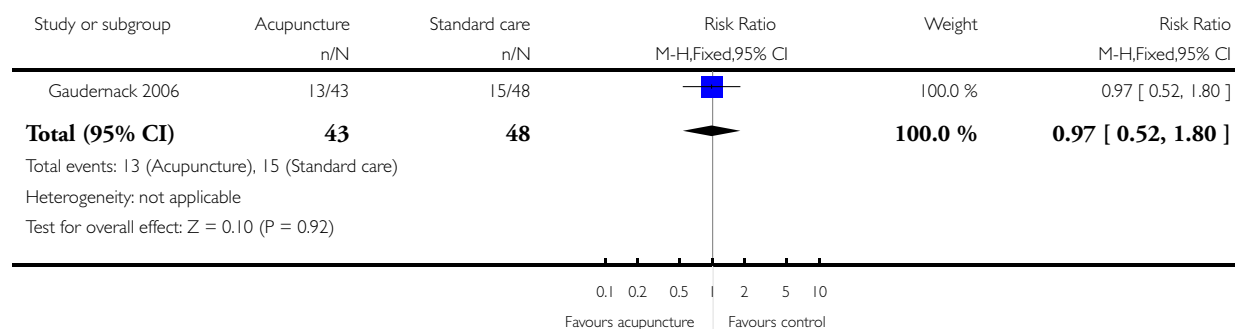


Analysis 1.4. Comparison 1 Acupuncture versus standard care, Outcome 4 Need for epidural.

Review: Acupuncture for induction of labour

Comparison: 1 Acupuncture versus standard care

Outcome: 4 Need for epidural

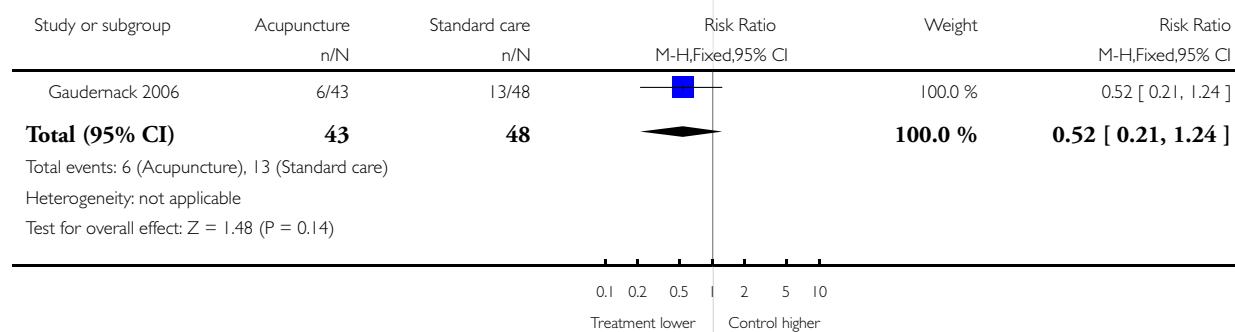


Analysis 1.5. Comparison 1 Acupuncture versus standard care, Outcome 5 Instrumental vaginal delivery.

Review: Acupuncture for induction of labour

Comparison: 1 Acupuncture versus standard care

Outcome: 5 Instrumental vaginal delivery

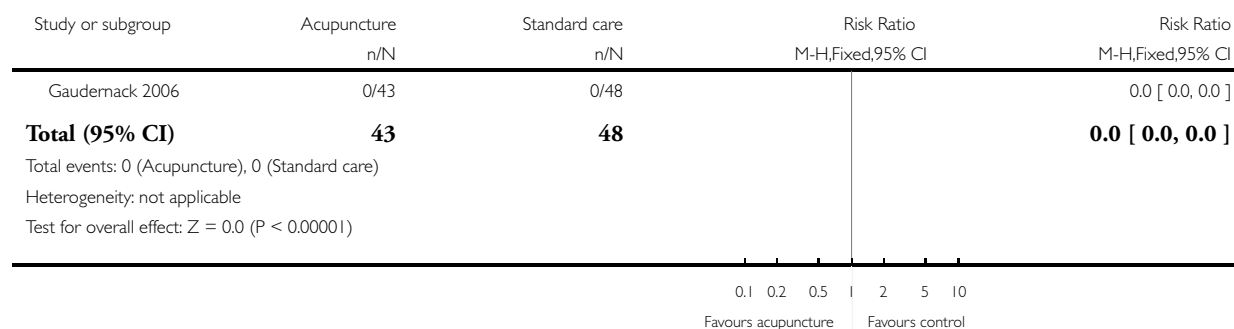


Analysis 1.6. Comparison 1 Acupuncture versus standard care, Outcome 6 Apgar score less than 7.

Review: Acupuncture for induction of labour

Comparison: 1 Acupuncture versus standard care

Outcome: 6 Apgar score less than 7

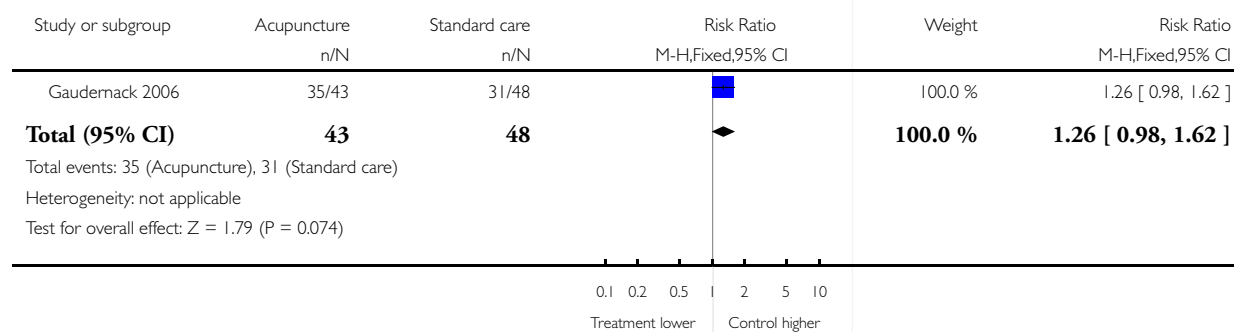


Analysis 1.7. Comparison 1 Acupuncture versus standard care, Outcome 7 Oxytocin augmentation.

Review: Acupuncture for induction of labour

Comparison: 1 Acupuncture versus standard care

Outcome: 7 Oxytocin augmentation

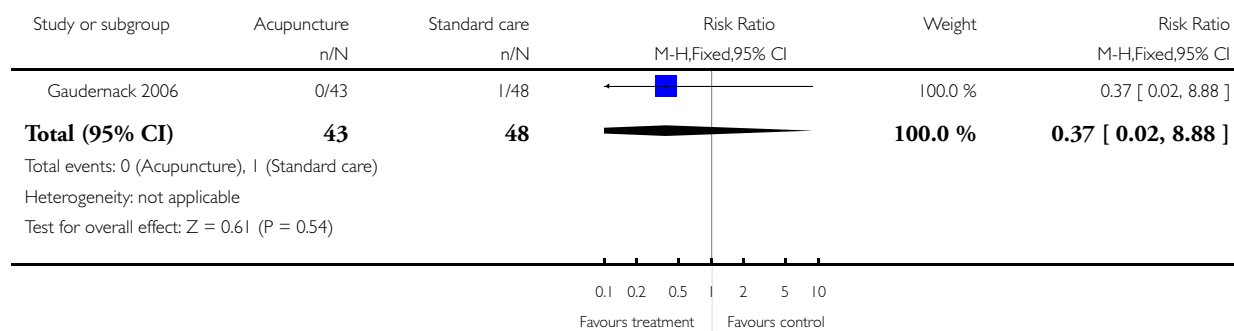


Analysis 1.8. Comparison 1 Acupuncture versus standard care, Outcome 8 Maternal infection.

Review: Acupuncture for induction of labour

Comparison: 1 Acupuncture versus standard care

Outcome: 8 Maternal infection

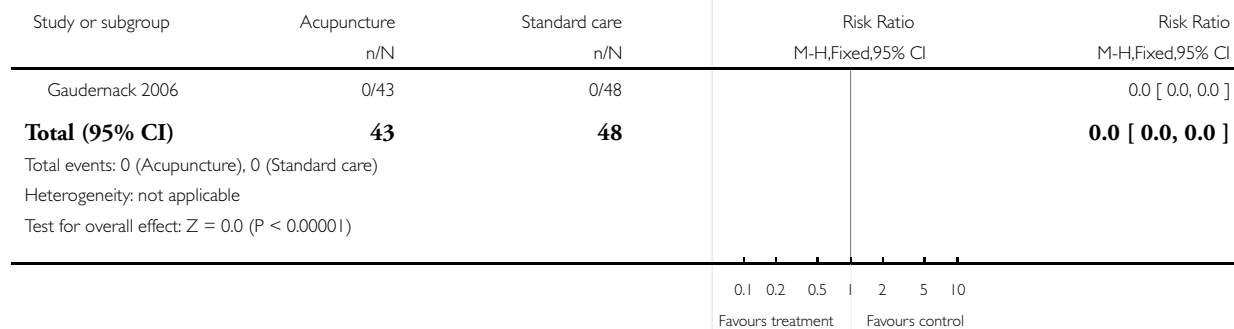


Analysis 1.9. Comparison 1 Acupuncture versus standard care, Outcome 9 Fetal infection.

Review: Acupuncture for induction of labour

Comparison: 1 Acupuncture versus standard care

Outcome: 9 Fetal infection

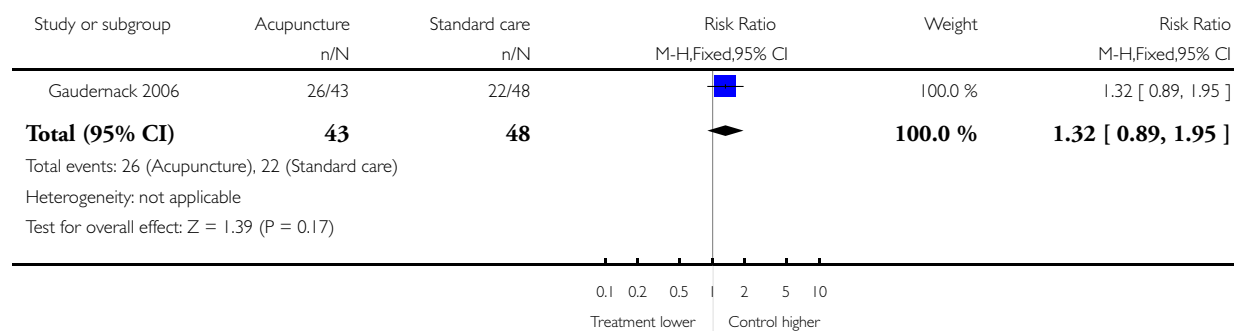


Analysis 1.10. Comparison 1 Acupuncture versus standard care, Outcome 10 Perineal tear.

Review: Acupuncture for induction of labour

Comparison: 1 Acupuncture versus standard care

Outcome: 10 Perineal tear



APPENDICES

Appendix 1. Methodological quality of trials

Methodological item	Adequate	Inadequate
Generation of random sequence	Computer generated sequence, random number tables, lot drawing, coin tossing, shuffling cards, throwing dice.	Case number, date of birth, date of admission, alternation.
Concealment of allocation	Central randomisation, coded drug boxes, sequentially sealed opaque envelopes.	Open allocation sequence, any procedure based on inadequate generation.

WHAT'S NEW

Last assessed as up-to-date: 30 January 2008.

10 November 2008	Amended	Contact details updated.
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HISTORY

Protocol first published: Issue 2, 2000

Review first published: Issue 1, 2001

13 August 2008	Amended	Corrected typing mistake in the Plain language summary.
8 February 2008	Amended	Converted to new review format.
8 February 2008	New search has been performed	Search updated. We identified nine new trial reports for eight trials, two of which have been included (Gaudernack 2006 ; Harper 2006), three excluded (Bo 2006 ; Martinez 2004 ; So 1979), one is awaiting assessment (Coeytaux 2007) and two are ongoing (Lorentzen 2006 ; Modlock 2006).
31 October 2003	New search has been performed	Search updated. We identified one new trial that met the inclusion criteria (Rabl 2001) and two new trials which we excluded (Dorr 1990 ; Romer 2000).

CONTRIBUTIONS OF AUTHORS

Caroline Smith conceptualised and took the lead in writing the protocol and review, performed initial searches of databases for trials, was involved in selecting trials for inclusion, performed data extraction and quality assessment of the included trials, was responsible for statistical analysis and interpretation of the data.

Caroline Crowther was involved with selecting trials for inclusion, performed data extraction and quality assessment of the included trials, interpretation of the data and commented on drafts of the protocol and review.

DECLARATIONS OF INTEREST

Caroline Smith is a principal investigator and Caroline Crowther is an associate investigator of a randomised controlled trial assessing the effects of acupuncture to stimulate labour.

SOURCES OF SUPPORT

Internal sources

- University of Adelaide, Adelaide, Australia.

External sources

- No sources of support supplied

INDEX TERMS

Medical Subject Headings (MeSH)

*Acupuncture Therapy; Cervical Ripening; Labor, Induced [*methods]; Randomized Controlled Trials as Topic

MeSH check words

Female; Humans; Pregnancy