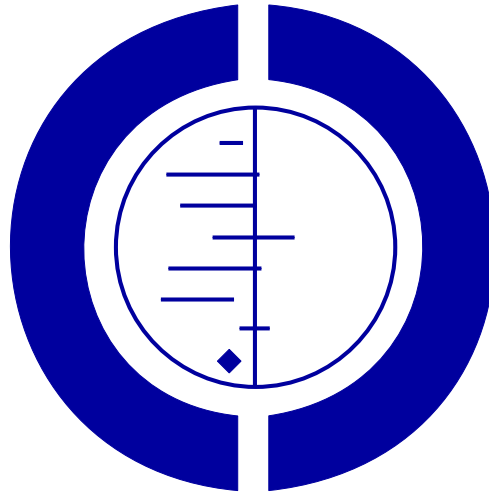


Epidural versus non-epidural or no analgesia in labour (Review)

Anim-Somuah M, Smyth R, Howell C



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TABLE OF CONTENTS

| | |
|---|----|
| ABSTRACT | 1 |
| PLAIN LANGUAGE SUMMARY | 2 |
| BACKGROUND | 2 |
| OBJECTIVES | 3 |
| CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW | 3 |
| SEARCH METHODS FOR IDENTIFICATION OF STUDIES | 4 |
| METHODS OF THE REVIEW | 4 |
| DESCRIPTION OF STUDIES | 6 |
| METHODOLOGICAL QUALITY | 6 |
| RESULTS | 7 |
| DISCUSSION | 9 |
| AUTHORS' CONCLUSIONS | 10 |
| FEEDBACK | 10 |
| POTENTIAL CONFLICT OF INTEREST | 11 |
| ACKNOWLEDGEMENTS | 11 |
| SOURCES OF SUPPORT | 11 |
| REFERENCES | 11 |
| TABLES | 16 |
| Characteristics of included studies | 16 |
| Characteristics of excluded studies | 25 |
| ANALYSES | 27 |
| Comparison 01. Epidural versus non-epidural analgesia in labour | 27 |
| Comparison 02. Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed | 28 |
| Comparison 03. Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation | 28 |
| Comparison 04. Sensitivity analysis of primary outcomes based on trial quality | 29 |
| Comparison 05. Subgroup analysis based on epidural technique (epidural without spinal compared to CSE) | 29 |
| INDEX TERMS | 29 |
| COVER SHEET | 29 |
| GRAPHS AND OTHER TABLES | 31 |
| Analysis 01.01. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 01 Woman's perception of pain relief in labour | 31 |
| Analysis 01.02. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 02 Instrumental delivery | 31 |
| Analysis 01.03. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 03 Caesarean section | 32 |
| Analysis 01.04. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 04 Apgar score less than 7 at 5 minutes | 33 |
| Analysis 01.05. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 05 Maternal satisfaction with pain relief in labour | 34 |
| Analysis 01.06. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 06 Long-term backache | 35 |
| Analysis 01.07. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 07 Length of first stage of labour (minutes) | 35 |
| Analysis 01.08. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 08 Length of second stage of labour (minutes) | 36 |
| Analysis 01.09. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 09 Oxytocin augmentation | 37 |
| Analysis 01.10. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 10 Caesarean section for fetal distress | 38 |
| Analysis 01.11. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 11 Caesarean section for dystocia | 39 |
| Analysis 01.12. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 12 Time of administration of pain relief to time pain relief was satisfactory | 39 |

| | |
|--|----|
| Analysis 01.13. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 13 Woman's perception of pain relief during 1st stage of labour | 40 |
| Analysis 01.14. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 14 Woman's perception of pain relief during the 2nd stage of labour | 40 |
| Analysis 01.15. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 15 Maternal satisfaction with childbirth experience | 41 |
| Analysis 01.16. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 16 Perceived feeling of poor control in labour | 41 |
| Analysis 01.17. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 17 Need for additional means of pain relief | 42 |
| Analysis 01.19. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 19 Maternal hypotension as defined by trial authors | 43 |
| Analysis 01.20. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 20 Postnatal depression (authors definition, on medication, or self-reported) | 43 |
| Analysis 01.22. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 22 Motor blockade | 44 |
| Analysis 01.23. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 23 Respiratory depression requiring oxygen administration | 44 |
| Analysis 01.25. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 25 Headache | 45 |
| Analysis 01.28. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 28 Perineal trauma requiring suturing | 45 |
| Analysis 01.29. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 29 Nausea and vomiting | 46 |
| Analysis 01.30. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 30 Itch | 46 |
| Analysis 01.31. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 31 Fever > 38 degrees C | 47 |
| Analysis 01.32. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 32 Shivering | 47 |
| Analysis 01.33. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 33 Drowsiness | 48 |
| Analysis 01.34. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 34 Urinary retention | 48 |
| Analysis 01.35. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 35 Catheterisation during labour | 49 |
| Analysis 01.37. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 37 Malposition | 49 |
| Analysis 01.38. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 38 Surgical amniotomy | 50 |
| Analysis 01.39. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 39 Neonatal intensive care unit admission | 50 |
| Analysis 01.40. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 40 Umbilical artery pH < 7.2 at delivery | 51 |
| Analysis 01.41. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 41 Acidosis defined by cord arterial pH < 7.15 | 51 |
| Analysis 01.42. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 42 Naloxone administration | 52 |
| Analysis 01.46. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 46 Meconium staining of liquor | 52 |
| Analysis 02.01. Comparison 02 Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed, Outcome 01 Instrumental vaginal delivery | 53 |
| Analysis 02.02. Comparison 02 Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed, Outcome 02 Caesarean section | 54 |
| Analysis 02.03. Comparison 02 Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed, Outcome 03 Apgar score less than 7 at 5 minutes | 55 |
| Analysis 03.01. Comparison 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation, Outcome 01 Instrumental delivery | 56 |
| Analysis 03.02. Comparison 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation, Outcome 02 Caesarean section | 57 |
| Analysis 03.03. Comparison 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation, Outcome 03 Apgar score less than 7 at 5 minutes | 58 |
| Analysis 03.04. Comparison 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation, Outcome 04 Maternal satisfaction with pain relief in labour | 58 |

| | |
|--|----|
| Analysis 03.05. Comparison 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation, Outcome 05 Long-term backache | 59 |
| Analysis 04.01. Comparison 04 Sensitivity analysis of primary outcomes based on trial quality, Outcome 01 Woman's perception of pain relief in labour | 59 |
| Analysis 04.02. Comparison 04 Sensitivity analysis of primary outcomes based on trial quality, Outcome 02 Instrumental delivery | 60 |
| Analysis 04.03. Comparison 04 Sensitivity analysis of primary outcomes based on trial quality, Outcome 03 Caesarean section | 61 |
| Analysis 04.04. Comparison 04 Sensitivity analysis of primary outcomes based on trial quality, Outcome 04 Apgar score less than 7 at 5 minutes | 62 |
| Analysis 04.05. Comparison 04 Sensitivity analysis of primary outcomes based on trial quality, Outcome 05 Women satisfied with pain relief | 62 |
| Analysis 05.01. Comparison 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE), Outcome 01 Instrumental delivery | 63 |
| Analysis 05.02. Comparison 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE), Outcome 02 Caesarean section | 64 |
| Analysis 05.03. Comparison 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE), Outcome 03 Apgar score less than 7 at 5 minutes | 65 |
| Analysis 05.04. Comparison 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE), Outcome 04 Women satisfied with their pain relief | 66 |

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ABSTRACT

Background

Epidural analgesia is a central nerve block technique achieved by injection of a local anaesthetic close to the nerves that transmit pain and is widely used as a form of pain relief in labour. However, there are concerns regarding unintended adverse effects on the mother and infant.

Objectives

To assess the effects of all modalities of epidural analgesia (including combined -spinal-epidural) on the mother and the baby, when compared with non-epidural or no pain relief during labour.

Search strategy

We searched the Cochrane Pregnancy and Childbirth Group Trials Register (June 2005).

Selection criteria

Randomised controlled trials comparing all modalities of epidural with any form of pain relief not involving regional blockade, or no pain relief in labour.

Data collection and analysis

Two of the review authors independently assessed trials for eligibility, methodological quality and extracted all data. Data were entered into RevMan and double checked. Primary analysis was by intention-to-treat; sensitivity analyses excluded trials with > 30% of women receiving un-allocated treatment.

Main results

Twenty-one studies involving 6664 women were included, all but one study compared epidural analgesia with opiates. For technical reasons, data on women's perception of pain relief in labour could only be included from one study which found epidural analgesia to offer better pain relief than non-epidural analgesia (weighted mean difference (WMD) -2.60, 95% confidence interval (CI) -3.82 to -1.38, 1 trial, 105 women). However, epidural analgesia was associated with an increased risk of instrumental vaginal birth (relative risk (RR) 1.38, 95% CI 1.24 to 1.53, 17 trials, 6162 women). There was no evidence of a significant difference in the risk of caesarean delivery (RR 1.07, 95% CI 0.93 to 1.23, 20 trials, 6534 women), long-term backache (RR 1.00, 95% CI 0.89 to 1.12, 2 trials, 814 women), low neonatal Apgar scores at five minutes (RR 0.70, 95% CI 0.44 to 1.10, 14 trials, 5363 women), and maternal satisfaction with pain relief (RR 1.18 95% CI 0.92 to 1.50, 5 trials, 1940 women). No studies reported on rare but potentially serious adverse effects of epidural analgesia.

Authors' conclusions

Epidural analgesia appears to be effective in reducing pain during labour. However, women who use this form of pain relief are at increased risk of having an instrumental delivery. Epidural analgesia had no statistically significant impact on the risk of caesarean

section, maternal satisfaction with pain relief and long-term backache and did not appear to have an immediate effect on neonatal status as determined by Apgar scores. Further research may be helpful to evaluate rare but potentially severe adverse effects of epidural analgesia on women in labour and long-term neonatal outcomes.

PLAIN LANGUAGE SUMMARY

Epidurals for pain relief in labour

Epidurals are widely used for pain relief in labour. There are various types, but all involve an injection into the lower back. The review of trials showed that epidurals relieve pain better than other types of pain medication, but they can lead to more use of instruments to assist with the birth. There was no difference in caesarean delivery rates, long-term backache, or effects on the baby soon after birth. However, women who used epidurals were more likely to have a longer second stage of labour, need their labour contractions stimulated, experience very low blood pressure, be unable to move for a period of time after the birth, have problems passing urine, and suffer fever. Further research on reducing the adverse outcomes with epidurals would be helpful.

BACKGROUND

Pain relief is an important issue for women in labour. The level of pain experienced and the effectiveness of pain relief may influence a woman's satisfaction with labour and delivery and may have immediate and long-term emotional and psychological effects (Christiansen 2002). The type of pain relief used in labour may impact on breastfeeding and mother-infant interaction (Walker 1997).

Women experience varying degrees of pain in labour and exhibit an equally varying range of responses to it. An individual's reaction to the pain of labour may be influenced by the circumstances of her labour, the environment, her cultural background, preparation towards her labour and the support available to her (Brownridge 1991; McCrea 2000; Rowlands 1998). Need for pain relief in labour is also influenced by the type of onset of labour (spontaneous or induced) and medical interventions such as instrumental vaginal delivery and episiotomy. Several methods of relieving pain in labour and various coping strategies have been advocated, ranging from limited intervention such as breathing exercises to medical techniques like epidural analgesia. Regardless of the intensity of the pain experienced and response generated, it is important that whatever method is used to ameliorate maternal discomfort, it is both effective and safe for the mother and baby.

Relaxation therapies, distraction techniques and continuous support are believed to help women in labour to use their own resources to cope with pain. Other non-pharmacological methods used for relieving pain include acupressure, acupuncture, reflexology, aromatherapy, transcutaneous electrical nerve stimulation and intradermal injection of sterile water (Martensson 1999). Reported effectiveness of these methods vary (Carroll 1997; Cyna 2004; Ranta 1994; Smith 2003). There are data to show that women who have continuous intrapartum support are less likely to have pain relief in labour (Hodnett 2003) and measures, such as labouring in water, massage, acupuncture, and hypnosis may be

helpful therapies for pain management in labour (Chang 2002; Cluett 2004). Efficacy of other methods such as audioanalgesia and music therapy remains to be assessed (Cluett 2004). Pharmacological methods like inhalation of nitrous oxide, parenteral injection of opioids and regional analgesia in the form of epidural and combined spinal epidural are also commonly used to relieve pain in labour.

Epidural analgesia was first used in obstetric practice in 1946 and its use in labour has steadily increased until the last decade (DOH 2005). Approximately 20% of women in the UK (DOH 2005; Khor 2000) and 58% of women in the USA (Declercq 2002) use this form of pain relief. However, there is considerable variation in the availability and use of epidural analgesia between hospitals in the same country (DOH 2005). Epidural analgesia is a central nerve blockade technique, which involves the injection of a local anaesthetic into the lower region of the spine close to the nerves that transmit painful stimuli from the contracting uterus and birth canal. The anaesthetic inhibits nerve conduction by blocking sodium channels in nerve membranes, thereby preventing the propagation of nerve impulses along these fibres. Blocking of painful impulses from the nerves as they cross the epidural space results in analgesia which should be apparent within 10 to 20 minutes of administration. The anaesthetic placed in the epidural space exerts a concentration specific effect, affecting all the modalities of sensation of the blocked nerves to varying degrees, such that administration of a lower-dose anaesthetic (eg 0.125% bupivacaine) partially selectively blocks painful stimuli while preserving motor function, whereas higher doses of anaesthetic afford complete sensory and motor blockade limiting mobility in labour. Blocking of sympathetic nerves occurs at varying concentrations and manifests as vasodilatation and hypotension.

Epidural analgesia is considered to be effective for reducing pain in labour (Brownridge 1991; Howell 2001). The choice of drugs and dosage varies from institution to institution. Protocols re-

garding the care of women using epidural analgesia also vary between hospitals. Epidural solutions are administered either by bolus, continuous infusion or patient-controlled pump. An intermittent technique involves injections of local anaesthetic through a catheter positioned in the epidural space. Boluses of higher concentrations, as used in the earlier years, have been associated with a dense motor block resulting in reduced mobility, decreased pelvic tone and impairment of the bearing down effort in the second stage of labour (Thornton 2001). More recently there has been a trend to use a lower concentration of local anaesthetic in combination with a variety of opiates; these combinations provide analgesic effect while allowing the woman to maintain some motor function, such as the ability to move during her labour and retain her ability to bear down (COMET 2001; Russell 2000). Combined spinal-epidural (CSE) involves a single injection of local anaesthetic and/or opiate into the cerebral spinal fluid as well as insertion of the epidural catheter. CSE combines the advantages of spinal analgesia (faster onset of pain relief, more reliable analgesia) with the advantages of epidural analgesia such as continuing pain relief, potentially maintained throughout the entire duration of labour (Hughes 2003). Epidural analgesia allows the woman to remain alert during labour. The regional administration of epidural drugs may help avoid some systemic side-effects of analgesic medication on the baby, such as opioid-induced neonatal respiratory depression. A functioning epidural allows the option of regional anaesthesia for interventions such as caesarean section or manual removal of retained placenta, thereby avoiding the risks associated with general anaesthesia (Hibbard 1996). However, spinal anaesthesia can also be used for this purpose.

Although epidural analgesia may provide effective pain relief in labour, it may sometimes give inadequate analgesia which may be due to non-uniform spread of local anaesthetic. Reported maternal complications include hypotension - a reduction in maternal blood pressure (BP). Severe sudden hypotension (more than 20% decrease in baseline BP) may result in a clinically significant decrease in utero-placental blood flow, which could potentially affect delivery of oxygen to the baby. This may especially compromise a baby with inadequate reserves (Vincent 1998). For this reason intravenous fluids may be given before administering the epidural drugs (fluid preload) to attenuate the decrease in maternal blood pressure. Side-effects such as itchiness, drowsiness, shivering and fever have also been reported (Buggy 1995; Eberle 1996). Women may develop urinary retention while using epidural analgesia. This may necessitate the insertion of a catheter to drain the bladder. Urinary retention in the postpartum period has been attributed to long labours in women using epidural analgesia (Liang 2002). Less common side-effects reported are accidental puncture of the dura, which can sometimes cause severe headache - post-dural puncture headache (1%) (Stride 1993). This resolves spontaneously in some women; however, a blood patch may be needed when the headache is persistent. This involves a sterile injection of 15 to 20 ml of the woman's fresh blood into the epidural space (Bromage 1999;

Vincent 1998). This resolves the headache for 60% of women.

Epidural analgesia may influence the course of labour. There have been suggested associations with malpositions of the fetal head, prolonged labour, increased use of oxytocin and of instrumental deliveries (Eberle 1996); possible effects on the risk of caesarean section continue to be debated (Lieberman 2002). Effects of epidural analgesia on the neonate may be mixed. Higher cord pH values and less naloxone use at birth have been reported (Halpern 1998) as has a greater need for neonatal resuscitation (COMET 2001). It has been suggested that babies of women who use epidural analgesia may be more prone to low blood sugar in the first hours after birth (Swanstrom 1981b).

The aim of this review is to assess the effectiveness of analgesia and benefits afforded by epidural, and the risk of potential adverse effects when compared with non-epidural methods of relieving pain in labour or no pain relief.

Readers may wish to refer to the following Cochrane systematic reviews for further information about pain management during labour: 'Caregiver support for women during labour' (Hodnett 2003), 'Complementary and alternative therapies for pain management in labour' (Smith 2003), 'Types of intramuscular opioids for maternal pain relief in labour' (Elbourne 1998), 'Combined spinal epidural versus epidural for pain relief in labour' (Hughes 2003).

OBJECTIVES

To assess the effects of all modalities of epidural analgesia (including combined-spinal epidural), during labour on the woman and the baby, when compared with other forms of pain relief or no pain relief.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

Randomised controlled trials comparing epidural analgesia with alternative forms of pain relief or no pain relief in labour. Abstracts of unpublished manuscripts of randomised control trials were included. Quasi-randomised trials were excluded.

Types of participants

Pregnant women requesting pain relief in labour, regardless of parity and whether labour was spontaneous or induced.

Types of intervention

All forms of epidural administration, compared with any form of pain relief not involving regional blockade, or no pain relief, were considered. Trials comparing different techniques of epidural are the subject of another review (Hughes 2003).

Types of outcome measures

Primary outcomes

1. Woman's perception of pain relief in labour;
2. instrumental delivery;
3. caesarean section;
4. low Apgar score less than seven at five minutes;
5. maternal satisfaction with pain relief in labour;
6. long-term backache (as defined by trial authors)

Secondary outcomes

Maternal

7. length of first stage of labour;
8. length of second stage of labour;
9. oxytocin augmentation;
10. caesarean section for fetal distress;
11. caesarean section for dystocia;
12. time of administration of pain relief to the time the level of pain relief was satisfactory;
13. woman's perception of pain relief in first stage of labour;
14. woman's perception of pain relief in second stage of labour;
15. maternal satisfaction with childbirth experience;
16. perceived feeling of poor control in labour;
17. need for other means of pain relief;
18. mother-baby bonding (as defined by trial authors);
19. maternal hypotension (as defined by authors);
20. post-natal depression (authors' definition, treatment for depression or self reported);
21. breastfeeding failure (as defined by trial authors);
22. motor blockade;
23. respiratory depression requiring oxygen administration;
24. uterine rupture
25. headache;
26. headache requiring blood patch;
27. venous thromboembolic events;
28. perineal trauma requiring suturing;
29. vomiting;
30. itching;
31. fever;
32. shivers;
33. drowsiness;
34. urinary retention;
35. catheterisation during labour;
36. other morbidity (eg impaired consciousness, meningitis, intensive care unit admission, paralysis);
37. malposition (as defined by trial authors);
38. surgical amniotomy

Infant

39. admission to neonatal intensive care unit or special care nursery;
40. acidosis as defined by cord blood arterial pH less than 7.2;
41. acidosis as defined by cord blood arterial pH less than 7.15;
42. naloxone administration;

43. neonatal hypoglycaemia (less than or equal to 1.67 mmol/l);
44. birth trauma;
45. long-term neonatal complication (eg seizures, disability in childhood);
46. meconium staining of liquor;

Economic

47. postpartum hospital readmission within six weeks of discharge;
48. duration of postpartum hospital stay;
49. cost of hospital stay;
50. hospital follow up for long-term morbidity (as defined by trial authors)

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: Cochrane Pregnancy and Childbirth Group methods used in reviews.

We searched the Cochrane Pregnancy and Childbirth Group Trials Register by contacting the Trials Search Co-ordinator (June 2005).

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. handsearches of 30 journals and the proceedings of major conferences;
4. weekly current awareness search of a further 37 journals.

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 '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.

We did not apply any language restrictions.

METHODS OF THE REVIEW

Selection of studies

Two review authors independently assessed all potential studies, which were identified as a result of the search strategy, for inclusion.

We resolved any disagreement together by joint re-review of the data in the original article and discussion.

Assessment of methodological quality of included studies

We independently assessed the validity of each study using the criteria outlined in the Cochrane Handbook (Alderson 2004). Each study was assessed for quality of allocation of concealment, completeness to follow up and blinding in the assessment of outcome.

(1) Selection bias (randomisation and allocation concealment)

We assigned a quality score for each trial, using the following criteria:

- (A) adequate concealment of allocation, such as telephone randomisation, consecutively numbered sealed opaque envelopes;
- (B) unclear whether adequate concealment of allocation; study does not report any concealment approach, list or table used, sealed envelopes;
- (C) inadequate concealment of allocation, such as open list of random number tables, use of case record numbers, dates of birth or days of the week.

(2) Performance bias (blinding of participants, researchers and outcome assessment)

We assessed blinding using the following criteria:

- (1) blinding of participants and caregiver was not possible due to the type of intervention being assessed. Blinding of outcome assessment was possible and defined as either yes/no/unclear.

(3) Attrition bias

We assessed completeness to follow up using the following criteria:

- (1) A - less than 5% participants excluded from analysis;
- (2) B - 5% to 10% of participants excluded from analysis;
- (3) C - more than 10% and less than 20% of participants excluded from analysis;
- (4) D - more than 20% of participants excluded from analysis.

We excluded quasi-randomised trials, trials where allocation concealment was clearly inadequate (C-selection bias) and trials where more than 20% of participants were excluded from the analysis (D-attrition bias).

Data extraction and management

We designed a form to extract data. Two review authors extracted the data independently using the agreed form. We resolved differences by reviewing the data in the original article together and discussion. We used the Review Manager software (RevMan 2003) to double-enter the data.

When information regarding any of the above was unclear, we attempted to contact authors of the original reports to provide further details where possible.

Measures of treatment effect

We carried out statistical analysis using the Review Manager software (RevMan 2003). We used a fixed effect meta-analysis for combining data when trials were sufficiently similar.

For dichotomous data: we present results as summary relative risk with 95% confidence intervals.

For continuous data: the weighted mean difference was used when outcomes were measured in the same way between trials. We intended to use the standardised mean difference to combine trials that measure the same outcome, but use different methods, and report any evidence of skewness.

We analysed data on an intention-to-treat basis. Therefore all participants with available data were included in the analysis in the group to which they are allocated, regardless of whether or not they received the allocated intervention.

Where in the original reports participants were not analysed in the group to which they were randomised, and there was sufficient information in the trial report, we restored them to the correct group, where possible.

Unit of analysis issues

Cluster randomised trials

If we had identified cluster-randomised trials, we would have incorporated them into the analysis using the methods described by Donner et al (Donner 2001).

Assessment of heterogeneity

Tests of heterogeneity between trials were applied when appropriate using the I^2 statistic. When we identified high levels of heterogeneity among the trials (exceeding 50%), we explored it by prespecified subgroup analysis and performed a sensitivity analysis based on trial quality. A random-effects meta-analysis was used as an overall summary when this was considered appropriate.

Sensitivity analysis

We prespecified that we would perform the following sensitivity analysis:

- for primary outcomes excluding trials where more than 30% of women did not receive their allocated treatment or received an additional form of analgesia to that allocated;
- by trial quality, excluding trials with unclear allocation concealment

Subgroup analyses

We planned to carry out the following subgroup analyses based on:

- parity: primigravid women compared with parous women;
- number of babies: multiple pregnancy compared with singleton pregnancy;
- fetal presentation: breech compared with cephalic;
- previous mode of delivery: caesarean section compared with vaginal delivery and no previous delivery;
- different epidural regimes: local anaesthetic alone compared with local anaesthetic/opiate combined regimes;

- epidural technique: epidural alone compared with combined-spinal epidural;
- year trial performed: before 1985 compared with trials performed in 1985 and after. The rationale for this analysis was based on the assumption that clinical practice is ever changing and trials performed before 1985 would have used a higher concentration of local anaesthetic agents causing more dense motor blockade. We acknowledge this cut off is arbitrary.

DESCRIPTION OF STUDIES

A total of twenty-one trials (48 publications) were included. Thirteen of those recruited only nulliparous women; four stated that they recruited both parous and nulliparous women; one trial recruited parous women only; and parity was not mentioned in the remaining three. The majority of the studies included women at more than 36 weeks' gestation in spontaneous labour with no obstetric or medical complications. Exceptions were Dickinson 2002 and Loughnan 2000, who included women in both spontaneous and induced labours; Lucas 2001, who recruited only women with pregnancy induced hypertension in both spontaneous and induced labours; Head 2002 and Hogg 2000, who included only women with pre-eclampsia at more than 24 weeks' gestation in labour.

Twenty trials compared epidural analgesia with opioids: pethidine (thirteen trials) (Clark 1998; Gambling 1998; Head 2002; Hogg 2000; Howell 2001; Loughnan 2000; Lucas 2001; Muir 1996; Philipsen 1989; Sharma 1997; Sharma 2002; Thalme 1974; Thorp 1993); butorphanol (one trial) (Bofill 1997); fentanyl (two trials) (Muir 2000; Nikkola 1997); phenoperidine (one trial) (Grandjean 1979); pethidine and tramadol (one trial) (Jain 2003); pethidine and no analgesia (one trial) (Long 2003); combination of methods: pethidine, Entonox®, transcutaneous electrical nerve stimulation (TENS) and one-to-one midwifery support (one trial) (Dickinson 2002). One trial compared epidural with no form of analgesia (Morgan-Ortiz 1999). In the control groups, opioids were administered as intravenous patient-controlled analgesia (PCA) (seven trials), intravenous injection (seven trials) and intramuscular injection (five trials). The route of administration was unclear in one trial.

Eight of the studies mentioned giving intravenous fluid preload. Bupivacaine was used for the epidural analgesia in all of the studies when reported, apart from two studies - Grandjean 1979 and Long 2003 used lignocaine and ropivacaine respectively. The agents used in the epidural were not mentioned in two trials (Hogg 2000; Morgan-Ortiz 1999). Bupivacaine was supplemented with fentanyl in eight of the studies (Bofill 1997; Gambling 1998; Head 2002; Jain 2003; Long 2003; Lucas 2001; Sharma 1997; Sharma 2002) and with pethidine in one (Muir 1996). Continuous infusion was used in seven studies (Bofill 1997; Gambling 1998; Head 2002; Jain 2003; Lucas 2001; Sharma 1997; Sharma 2002). In

these studies a bolus of 0.25% of bupivacaine was used followed by infusion of 0.0125 % to maintain epidural analgesia. Two studies used a much higher concentration of bupivacaine (Philipsen 1989 used 0.375% bupivacaine and Nikkola 1997 used 0.5%). Patient-controlled epidural analgesia (PCEA) was used in four studies (Dickinson 2002; Long 2003; Muir 1996; Sharma 2002). The level of block was mentioned in eight studies. Only three of the studies (Dickinson 2002; Gambling 1998; Long 2003) used combined spinal epidural (CSE); in Dickinson 2002 spinal block was achieved using fentanyl 25 mg and bupivacaine 2 mg. Epidural was started following the onset of spinal analgesia. In Gambling 1998 spinal block was achieved with sufentanil alone and epidural infusion was started immediately following the intrathecal administration of the opioid, whereas the spinal block in Long 2003 was achieved with ropivacaine supplemented with fentanyl and epidural analgesia was given only after dissipation of the spinal analgesia. Epidural use was discontinued in the second stage of labour in three studies (Loughnan 2000; Nikkola 1997; Philipsen 1989).

Outcomes reported by most studies were maternal satisfaction with pain relief, caesarean section, instrumental delivery, duration of first and second stages of labour and oxytocin augmentation. Two studies reported on long-term backache and one study only reported on the woman's perception of poor control in labour and the woman's satisfaction with childbirth experience. Eleven other studies (Bofill 1997; Dickinson 2002; Gambling 1998; Jain 2003; Loughnan 2000; Muir 1996; Nikkola 1997; Philipsen 1989; Sharma 1997; Sharma 2002; Thorp 1993) reported on pain relief but these data could not be pooled because of different statistical methods used to summarise the average and variations, and measurements were sometimes undertaken at different time points following the intervention. None of the economic outcomes and possible rare side-effects of epidural analgesia were reported in the included studies.

See the tables of 'Characteristics of included studies' and 'Characteristics of excluded studies' for details of the individual studies.

METHODOLOGICAL QUALITY

The search strategy resulted in 79 references which were all assessed for inclusion. Twenty studies (26 publications) were excluded. Two of these (Revill 1979; Robinson 1980) were excluded because a high proportion of women were excluded from the analysis; 28% and 30% respectively. Five trials are awaiting assessment.

All included studies stated that women were randomly allocated to epidural analgesia and control groups. Information regarding generation of the randomisation sequence was clearly described in 16 studies. Of these, eleven trials used computerised randomisation (Bofill 1997; Clark 1998; Head 2002; Howell 2001; Gambling 1998; Loughnan 2000; Lucas 2001; Muir 2000; Sharma 1997; Sharma 2002; Thorp 1993). Randomisation was achieved with

random number tables in two studies (Jain 2003; Philipsen 1989), random selection of sealed envelopes in two studies (Dickinson 2002; Thalme 1974) and drawing of lots in one study (Grandjean 1979).

Allocation concealment was adequate by description in eleven trials (Bofill 1997; Clark 1998; Dickinson 2002; Head 2002, Howell 2001; Jain 2003; Loughnan 2000; Lucas 2001; Muir 2000; Sharma 1997; Sharma 2002). Four other trials (Gambling 1998; Philipsen 1989; Thalme 1974; Thorp 1993) used sealed envelopes that were not described as opaque (classified as B - unclear). Due to the nature of the intervention, it was not possible for the women or carers to be blinded. In Howell 2001 the outcome assessor for backache was blinded.

Intention-to-treat analysis was used in all included trials for outcome data extracted. All trials had less than 10% loss of participants to follow up except for two (Loughnan 2000; Howell 2001) (17% loss to follow up for the outcome of long-term backache only, at six months and 26 months respectively).

All but five studies report that a proportion of women (ranging from 1% to 62%) did not receive the randomised allocation or received another form of pain relief in addition to the randomised treatment (*see* 'Table of Characteristics of included studies').

RESULTS

Twenty-one trials involving 6664 women were included in this review. Data were available for all primary outcomes.

Primary outcomes

Maternal

Woman's perception of pain relief in labour

One trial, which involved 105 women, reported this outcome. Women in the epidural group reported better pain relief than the control group (weighted mean difference (WMD) -2.60, 95% confidence interval (CI) -3.82 to -1.38). Outcome was measured using a visual analogue score of 0 to 10, where 0 represented no pain and 10 the worst possible pain.

Instrumental vaginal delivery

Seventeen trials, involving 6162 women, reported this outcome. The risk of instrumental delivery was greater in the women randomised to epidural analgesia (relative risk (RR) 1.38, 95% confidence interval (CI) 1.24 to 1.53, risk difference (RD) 5%, number needed to treat (NNT) 20) compared with women randomised to non-epidural analgesia. The effect of epidural analgesia on instrumental delivery did not change significantly after excluding four trials where more than 30% of the women did not receive their allocated treatment or received another form of pain relief in addition (RR 1.66, 95% CI 1.41 to 1.94). Excluding trials based on trial quality did not significantly alter the results.

Caesarean section

Twenty trials, involving 6534 women, reported this outcome. There was no evidence of a statistically significant difference in the risk of caesarean section (RR 1.07, 95% CI 0.93 to 1.23). Sensitivity analysis based on excluding trials where more than 30% of the women did not receive their allocated treatment or received another form of pain relief in addition, did not significantly alter the results (RR 1.09, 95% CI 0.91 to 1.31). Excluding trials based on trial quality did not significantly alter the results.

Maternal satisfaction with pain relief

Five trials, involving 1940 women, reported this outcome. There was no evidence of significant difference between the two groups (RR 1.18, 95% CI 0.92 to 1.50). This result did not alter significantly after sensitivity analysis based on excluding trials where more than 30% of the women did not receive their allocated treatment or received another form of pain relief in addition (RR 1.23, 95% CI 0.97 to 1.55). Significant heterogeneity was found for this outcome, which was not attributable to trial quality. No difference was found between groups when using a random-effects model. Excluding one trial based on trial quality did not significantly alter the results.

Long-term backache

Two trials, involving 814 women, reported this outcome. One trial assessed backache at six months postpartum and the other trial at twenty six months. There was no evidence of significance difference in this outcome (RR 1.00, 95% CI 0.89 to 1.12) between the epidural and non-epidural groups. This result did not alter significantly after excluding one trial where more than 30% of the women did not receive their allocated treatment or received another form of pain relief in addition (RR 1.05, 95% CI 0.92 to 1.20).

Neonatal

Apgar score of less than seven at five minutes

Fourteen trials, involving 5363 women, reported this outcome. There was no evidence of significant difference between the two comparison groups (RR 0.70, 95% CI 0.44 to 1.10). After excluding four trials where more than 30% of the women did not receive their allocated treatment or received another form of pain relief in addition to their allocated treatment, the point estimate showed a 44% reduction in the relative risk of neonates, whose mothers received epidural, having this outcome. The confidence interval was close to statistical significance (RR 0.56, 95% CI 0.33 to 1.01). Excluding trials based on trial quality did not significantly alter the results.

Secondary outcomes

Maternal

Length of first stage of labour

Nine trials, involving 2328 women, reported this outcome. There was no evidence of a significant difference in this outcome (WMD 23.81 minutes, 95% CI -18.88 to 66.51).

Length of second stage of labour

Eleven trials involving 3580 women reported this outcome. Women with epidural analgesia had a statistically significant longer second stage of labour (WMD 15.55 minutes, 95% CI 7.46 to 23.63, 11 trials, 3580 women).

Use of oxytocin

Eleven trials, involving 4551 women, reported this outcome. Women with epidural analgesia had an increased risk in the use of oxytocin (RR 1.18, 95% CI 1.03 to 1.34) when compared with women using non-epidural forms of analgesia.

Caesarean section for fetal distress:

Ten trials, involving 4421 women, reported this outcome. The point estimate showed a 42% increase in the relative risk of caesarean section for fetal distress in the epidural group; the confidence interval was close to statistical significance (RR 1.42, 95% CI 0.99 to 2.03).

Caesarean section for dystocia

Eleven trials, involving 4606 women, reported this outcome. There was no evidence of significant difference in this outcome (RR 0.90, 95% CI 0.73 to 1.12).

Time of administration of pain relief to the time pain relief was satisfactory

One trial, involving 82 women, reported this outcome. Time (minutes) to achieve pain relief was less in the epidural group compared with the non-epidural group (RR -6.70, 95% CI -8.02 to -5.38)

Malposition

This outcome was reported in four studies, involving 673 women. The point estimate showed a 40% increase in the relative risk of malposition in women using epidural analgesia; the confidence interval was close to statistical significance (RR 1.40, 95% CI 0.98 to 1.99).

Woman's perception of pain relief in the first and second stage of labour

Two trials, involving 164 women, reported these outcomes using the Visual Analogue Score 0 to 10, where 0 represents no pain and 10 the worst pain. Women with epidural analgesia reported less pain in both the first and second stages of labour (WMD -15.67, 95% CI -16.98 to -14.35) and (WMD -20.75, 95% CI -22.50 to -19.01) compared with women in the control group.

Need for additional means of pain relief

Fifteen trials, involving 6019 women, reported this outcome. Women with an epidural had significantly less need for pain relief in addition to their allocation (RR 0.05, 95% CI 0.02 to 0.17) compared with women using non-epidural forms of analgesia. Significant heterogeneity was detected in this outcome, which was not attributable to trial quality, and has been analysed using a random-effects model.

Maternal hypotension

Seven trials, involving 2759 women, reported this outcome. Women with epidural analgesia had a significant increase in the risk of hypotension (RR 20.09, 95% CI 4.83 to 83.64). Significant heterogeneity was detected in this outcome, which was not attributable to trial quality, and was analysed using a random-effects model.

Motor Blockade

Two trials, involving 322 women, reported this outcome. Women with epidural analgesia had increased risk of motor blockade (RR 31.71, 95% CI 4.16 to 241.99) compared with the non-epidural group.

Urinary retention and catheterisation during labour

Three trials, involving 283 women, reported on urinary retention. Women with epidural analgesia had increased risk of this outcome (RR 17.05, 95% CI 4.82 to 60.39). Two trials, involving 1103 women, reported catheterisation. No significant differences were noted for women with epidural analgesia for this outcome (RR 1.81, 95% CI 0.44 to 7.46) compared with women with non-epidural analgesia. Significant heterogeneity was detected in this outcome, which was not attributable to trial quality, and has been analysed using a random-effects model.

Fever

Three trials, involving 1912 women, reported this outcome. Women with epidural analgesia had increased risk of maternal fever of at least 38 degree centigrade (RR 3.67, 95% CI 2.77 to 4.86) compared with women using non-epidural analgesia.

There was no evidence of significant difference in the following outcomes

Maternal satisfaction with childbirth experience (one trial, 332 women, RR 0.95, 95% CI 0.87 to 1.03); feeling of poor control in labour (one trial, 344 women, RR 1.17, 95% CI 0.62 to 2.21); post-natal depression (one trial, 313 women, RR 0.63, 95% CI 0.38 to 1.05); nausea and vomiting (seven trials, 2355 women, RR 1.03, 95% CI 0.87 to 1.22); drowsiness (three trials, 414 women, RR 1.00, 95% CI 0.12 to 7.99); surgical amniotomy (two trials, 211 women, RR 1.03, 95% CI 0.74 to 1.43); headache (one trial, 206 women, RR 0.96, 95% CI 0.67 to 1.40).

No trials reported on the following outcomes: mother-baby bonding, breastfeeding failure, headache requiring blood patch, venous thromboembolic events, respiratory failure, uterine rupture and other potential severe adverse effects of epidural.

Neonatal

Umbilical cord pH less than 7.2

Six trials, involving 2774 women, reported this outcome. Neonates of mothers who had epidural analgesia had less risk of having an umbilical cord pH less than 7.2 (RR 0.80, 95% CI 0.66 to 0.96) compared with those whose mothers had non-epidural analgesia.

Naloxone administration

Eight trials, involving 2373 women, reported this outcome. Neonates whose mothers had epidural analgesia had less risk of requiring naloxone (RR 0.13, 95% CI 0.08 to 0.21) when compared with those who had non-epidural analgesia.

There was no evidence of significant difference in the following outcomes: meconium staining of liquor (four trials, 1426 women, RR 1.01, 95% CI 0.79 to 1.30); admission to neonatal intensive care unit (seven trials, 3125 women, RR 1.19, 95% CI 0.94 to 1.50); and umbilical arterial pH less than 7.15 (two trials, 382 women, RR 0.94, 95% CI 0.46 to 1.91).

No trials reported on neonatal hypoglycaemia, birth trauma, long-term neonatal morbidity.

Economic outcomes

No trials reported any of these outcomes.

Subgroup analysis

Two trials (Grandjean 1979; Thalme 1974) performed before 1985 were compared with the remaining trials for primary outcomes. Data were available for instrumental delivery, caesarean section and Apgar scores less than seven at five minutes. No significant differences were found between trials performed before 1985, after 1985 and when all the trials were combined. Three trials (Dickinson 2002; Gambling 1998; Long 2003) comparing combined spinal-epidural with non-epidural or no pain relief were compared with the remaining trials for primary outcomes. Data were available for instrumental delivery, caesarean section, maternal satisfaction with pain relief and Apgar score less than seven at five minutes. No significant differences were found between trials. Data were not available to perform the remaining prespecified subgroup analysis.

DISCUSSION

Over 6000 women were randomised into 21 trials comparing epidural analgesia with alternative forms of pain relief or no pain relief in labour. Evidence from this review demonstrates that epidural analgesia offers better pain relief in labour. However, women who use this form of pain relief have an increased risk of instrumental delivery when compared with women who use non-epidural forms of analgesia or no analgesia at all. There was no statistically significant evidence of difference in maternal satisfaction with pain relief, the risk of caesarean section, long-term backache (up to 26 months) or immediate adverse effects on the infant between the epidural and control groups. For the outcome caesarean section the relative risk was 1.07, 95% confidence interval 0.93 to 1.23. Although this finding remains statistically non-significant, a small increase in the risk of caesarean section cannot be excluded.

Some limitations of our analysis should be noted. Eleven studies reported women's perception of pain as an outcome but we could not extract the data from these studies for meta-analysis, because

trials measured this outcome differently and reported the data in a format not compatible with the software used. These studies used various forms of visual analogue scores as a way of measuring women's perception of pain but it was not possible to extract the data presented. In three of the studies (Bofill 1997; Sharma 1997; Sharma 2002), data were presented as graphical representation only. For two of the studies (Dickinson 2002; Muir 1996), it was unclear as to whether the data presented were means or medians. The trial by Philipsen 1989 used medians; Gambling 1998, Nikkola 1997 and Thorp 1993 measured this outcome at different time intervals and therefore could not be combined. Two studies (Jain 2003; Loughnan 2000) presented their data as the number of women experiencing different levels of pain.

Trials varied in the characteristics of participants, labour management protocols and epidural regimen. These factors may influence the course of labour, pain relief requirements and outcomes such as duration of labour, oxytocin augmentation and instrumental delivery. Combining studies using a high concentration of a local anaesthetic agent for epidural analgesia with low concentration techniques, and studies maintaining a block in the second stage of labour to those discontinuing may influenced some outcomes, in particular the duration of labour and instrumental delivery rates.

We planned a subgroup analysis based on parity, whether singleton or multiple pregnancy, fetal presentation, previous mode of delivery, different epidural regimens, epidural technique and year trial performed in an attempt to explore if these variations had any effect on the results. Analysis of different epidural regimens and year trial was performed did not significantly alter the results.

Substantial heterogeneity was detected for maternal satisfaction with pain relief, need for additional means of pain relief, maternal hypotension, length of first and second stages of labour and oxytocin augmentation. Heterogeneity was explored by trial quality and prespecified sensitivity analysis and subgroup analysis performed where data were available. There was considerable variation in outcome measures in trials reporting women's satisfaction with pain relief as previously discussed. None of the trials reporting maternal hypotension gave their definitions for this outcome therefore, there may be substantial differences here. Heterogeneity for the outcomes regarding length of labour and use of oxytocin augmentation may be explained by variations in clinical practice as to when labour begins and when oxytocin is required.

Most women in the control group were randomised to opioids and, therefore, the effect on some outcomes may be applicable to the use of opioids in labour rather than all other non-epidural forms of analgesia or no pain relief. Some women randomised to non-epidural analgesia received epidural as well. To a lesser extent some women in the epidural arm did not receive the intervention due to rapid labour. We included only data based on an intention-to-treat analysis. However, this approach may make the results difficult to interpret. In an attempt to address this issue, we conducted a further analysis on the primary outcomes, based on excluding trials

where more than 30% of women did not receive their allocated analgesic or received another form of pain relief in addition. This 30% cut off was chosen because it is similar to that found in large randomised trials of epidural (Lieberman 2002). This analysis did not alter the results significantly. For the outcome Apgar score of less than seven at five minutes, the point estimate showed a 44% reduction in the relative risk of this outcome in favour of epidural analgesia with confidence intervals close to statistical significance (RR 0.56, 95% CI 0.31 to 1.01). These data should be interpreted with caution as an analysis based on excluding these trials is not intention-to-treat and could potentially introduce bias.

The evidence presented in this review needs to be interpreted taking these limitations into account.

AUTHORS' CONCLUSIONS

Implications for practice

Epidural analgesia affords more effective pain relief than non-epidural forms of analgesia. However, women randomised to epidural had an increase in the length of the second stage of labour and the need for oxytocin, with an increase in the risk of instrumental vaginal delivery. The length of the first stage of labour was longer in the epidural group but did not reach statistical significance. The relative increase in the length of labour did not appear to affect the infants adversely for the outcomes measured in this review. The finding that epidural analgesia appears to alter the dynamics of labour necessitating the use of oxytocin needs to be applied in practice. Whether an increase in the duration of second stage of labour constitutes prolongation necessitating instrumental delivery should be a clinical decision. The evidence presented in this review should be made available to women considering pain relief in labour. The decision about whether to have an epidural should then be made in consultation between the woman and her carer.

Implications for research

Despite a large number of randomised trials including many women, none of the included studies reported on rare but serious adverse effects. Some of these data may be better obtained from large case series. There was no evidence of immediate effects on the baby; however, long-term consequences are still not known.

Further research is needed to minimise the adverse effects of epidural analgesia in women who choose epidural as their method of pain relief.

FEEDBACK

Olsen, April 1998

Summary

Epidural versus non-epidural or no analgesia in labour (Review)
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Abstract:

The section main results should use consistent terminology. The effect on pain relief was only reported in one small trial, and this should be referred to in the same way as for the adverse effects.

The conclusion is also inconsistent. A suggestion for the first sentence: 'Epidural analgesia is an effective method of pain relief during labour, but is associated with longer first and second stages of labour, increased oxytocin use, malrotation, instrumental delivery and Caesarean section; women should be counseled about these risks before labor.' The more rare maternal side effects could also be mentioned.

Background:

The statements about epidural as effective form of pain relief are not justified or referenced. It is unclear whether more evidence to support this effect is necessary.

Author's reply

Pain relief has now been reported in four studies, all of which showed epidural to be better than non-epidural analgesia. The review has been amended to take account of this, and the other comments.

[Summary of response from Charlotte Howell, May 1999]

Contributors

Summary of comments received from Ole Olsen, April 1998.

Vickers, August 1999

Summary

Results and discussion:

The interpretation of the summary statistic for Caesarean section is misleading. The lower limit of the 95% confidence interval is just below one (relative risk 1.27, 95% confidence interval 0.93-1.74), and so does not achieve statistical significance. The authors conclude 'there is no significant increase in the Caesarean section rate', but this under rates the clinical importance of these data. It is not usual to demand statistically significant differences between groups before considering it worth mentioning a possible adverse event to a patient. The most likely effect is an increase of 25%, but this may be as much as 75% and a small, 10%, decrease in the risk of Caesarean section is also possible.

Women considering their choice of pain relief should be warned that epidural analgesia probably increases their risk of having a Caesarean section.

Author's reply

This broader interpretation of the confidence intervals has been incorporated.

(Summary of response from M Anim-Somuah, April 2005.)

Contributors

Summary of comments received from Andrew Vickers, August 1999.

Vickers, April 2001

Summary

Update on previous comment

The reviewer stated in February 2000 that “This broader interpretation of the confidence intervals will be incorporated into the next update of the review.” In April 2001 this has yet to be done. The review continues to be misleading in stating that epidurals do not increase rates of caesarean section.

Author’s reply

The review has now been updated. With addition of new trials, the overall relative risk of caesarean section for women allocated epidural rather than other forms of analgesia was 1.07, 95% CI 0.93 to 1.23. The implications are discussed in the review.

(Summary of response from M. Anim-Somuah, April 2005.)

Contributors

Summary of comments from Andrew Vickers, April 2001.

POTENTIAL CONFLICT OF INTEREST

None known.

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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), one or more members 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

T A B L E S**Characteristics of included studies**

| Study | Bofill 1997 |
|------------------------|--|
| Methods | Computer-generated list of random numbers were prepared by an uninvolved third party. Randomisation was accomplished by selection of the next in a series of opaque, sealed envelopes. All women were accounted for. Intention-to-treat analysis was used. |
| Participants | 100 women recruited (epidural n = 49, narcotics n = 51). Eligibility: nulliparous women at 36-42 weeks' gestation, in spontaneous labour (at least 4 cm dilated). Exclusion: women with insulin dependant diabetes, chronic hypertension, PIH or twin pregnancy. |
| Interventions | Epidural: preload given 500-1000 ml sodium lactate 0.25% bupivacaine +/- 50-100 mg fentanyl until T10 sensory analgesia achieved, then continuous infusion 0.125% bupivacaine with 1.5 mg/ml fentanyl. Continued in 2nd stage. Narcotic: 1-2 mg Butophanol (1-2 hourly) IV. |
| Outcomes | Maternal: pain scores measured hourly, length of 1st and 2nd stage of labour, oxytocin in labour, malposition, amniotomy, nausea and vomiting, operative vaginal delivery, caesarean section, caesarean section for dystocia and fetal distress. Neonatal: Apgar scores (mean), arterial cord pH, naloxone administration. |
| Notes | University of Mississippi, USA. Active management of labour protocol. 33 of 39 operative vaginal deliveries in epidural group and 17 of 28 operative vaginal deliveries in opioid group were performed for purposes of resident training. 12 (24%) women randomised narcotic received epidural as well due to inadequate pain relief. 2 women randomised epidural delivered before receiving it. Trial carried out 1995-1996. |
| Allocation concealment | A – Adequate |

| Study | Clark 1998 |
|--------------|---|
| Methods | Computer-generated, random-number tables, group assignments were placed in sealed, opaque, sequentially numbered envelopes. All women accounted for. |

Characteristics of included studies (Continued)

| | |
|------------------------|---|
| | Intention-to-treat analysis used. |
| Participants | 318 women recruited (epidural n = 156, meperidine n = 162). Eligibility: nulliparous women in spontaneous labour (at least 50% cervical effacement or ruptured membranes, at least 2 contractions every 15 minutes) at 36 weeks' gestation or more, vertex presentation. Exclusion: maternal or fetal conditions precluding trial of labour, thrombocytopenia or coagulation disorder, or multiple pregnancy. |
| Interventions | Epidural: IV fluid bolus of 1 litre normal saline solution following by placement of the epidural catheter through the L2-3 or L3-4 interspace. A test dose of 3 ml 1% lignocaine with epinephrine was administered, followed by 9 ml 0.25% bupivacaine with 50 ug fentanyl in 3 divided doses at 10-minute intervals, if vital signs remained stable during the subsequent 15 minutes, a continuous infusion of 0.125% bupivacaine with 1 ug/ml fentanyl was initiated at 12 ml/h and titrated to maintain anaesthesia to the T10 dermatome level. IV meperidine: 50 to 75 mg meperidine every 90 minutes as needed. These participants did not receive pre-analgesic hydration. |
| Outcomes | Maternal: oxytocin use, length of 1st and 2nd stages of labour, second stage labour, mode of delivery, caesarean for dystocia, caesarean for fetal distress. Neonatal: Apgar score at 5 minutes, meconium, umbilical cord pH/BE (arterial and venous), umbilical artery pH < 7.15. |
| Notes | University of Louisville Hospital, Kentucky, USA. 84 (52%) women in opioid group did not receive intervention (no reason given in paper), but received an epidural. 9 women in epidural group did not receive intervention (5 inability to site catheter, 4 delivered before epidural inserted). Trial carried out 1995-1996. |
| Allocation concealment | A – Adequate |

Study

Dickinson 2002

| | |
|------------------------|--|
| Methods | Randomly selected from block group of sealed, opaque envelopes. Primary analysis: intention-to-treat analysis. Secondary analysis of compliant participants only, randomisation stratification into spontaneous and induced labour. All women accounted for. |
| Participants | 992 women recruited (epidural n = 493, continuous midwifery support group n = 499). Eligibility: nulliparous women at term with singleton cephalic presentation in spontaneous labour (cervix < 5 cm dilated) and induced labour. |
| Interventions | CSE: needle- through-needle approach. Preload 500-1000 ml crystalloids. Spinal block achieved with fentanyl -25 micrograms and bupivacaine -2 mg. Following onset of analgesia epidural catheter dosed with 0.125% bupivacaine -6 ml then participant controlled epidural analgesia till delivery with 0.1% bupivacaine and 2 micrograms of pethidine. 136 women did not receive epidural. Continuous midwifery support group was 1:1 midwife participant ratio, IM pethidine, nitrous oxide inhalation, TENS, and/or non-pharmacological forms of pain relief. |
| Outcomes | Maternal: pain scores, caesarean section, duration of 1st and 2nd stages of labour. operative vaginal delivery, vomiting, catheterisation during labour, fever (>37.5 degrees) and satisfaction with childbirth (median VAS); breastfeeding reported on compliant participants only. Neonatal: Apgar scores, cord pH. |
| Notes | Australia. 137 (27%) women randomised to epidural received continuous midwifery support. 306 (62%) women randomised continuous midwifery support received epidural. |
| Allocation concealment | A – Adequate |

Study

Gambling 1998

| | |
|---------|--|
| Methods | Computer-generated, in groups of 100, allocation was secured in a numbered and sealed envelope. Intention-to-treat analysis used. All women accounted for. |
|---------|--|

Characteristics of included studies (Continued)

| | |
|------------------------|---|
| Participants | 1223 women recruited (epidural n = 616, meperidine = 607). Eligibility: nulliparous and parous women in spontaneous labour (regular contractions, at least 3 cms dilated), singleton, cephalic presentation, cervix < 5 cm dilated. Exclusion: pregnancy complication (not specified), more than 5 cm dilated, multiple pregnancy, non-cephalic presentation. |
| Interventions | CSE: preload with 500 ml sodium lactate. Catheter L2-3 or L3-4 interspace. Spinal block with 10 microgram sufentanil in 2 ml normal saline. Needle-through-needle approach. Following dissipation of spinal analgesia, epidural analgesia achieved with 0.25% bupivacaine in 3-5 ml increments to achieve T10-T8 sensory level. This was followed by epidural infusion 0.125% bupivacaine and 2 microgram per ml fentanyl at 8 ml/h. Rate of infusion halved during second stage of labour. Meperidine group: 50 mg meperidine + 25 mg promethazine hydrochloride intravenously. Further 50 mg IV meperidine on request hourly to a maximum of 200 mg in 4 hours. All women had IV fluid administration. |
| Outcomes | Maternal: intrapartum visual analogue pain score and postpartum overall satisfaction with labour analgesia, oxytocin, mode of delivery, hypotension, meconium, surgical amniotomy, motor block, fever, itch, operative vaginal delivery. Neonatal: Apgar score, birthweight, cord arterial pH. |
| Notes | University of Texas, USA. Amniotomy routinely performed in active labour when fetal head is well applied to cervix. Intrauterine pressure catheter used to assess adequacy of contraction if progress < 1 cm/h and oxytocin augmentation employed if uterine pressure < 200 monteideo units. 216 (35%) women randomised epidural did not receive it (82 received meperidine, 52 declined any analgesia, 43 rapid delivery, 39 non-study drug used). For 255 (42%) women randomised meperidine: 102 received epidural as well, 57 received epidural only, 42 declined any analgesia, 30 rapid delivery, 24 non-study drug used. Trial carried out 1994-1995. |
| Allocation concealment | B – Unclear |

| | |
|------------------------|--|
| Study | Grandjean 1979 |
| Methods | Random allocation by drawing lots. All women accounted for. |
| Participants | 90 women recruited (epidural n = 30, phenoperidine n = 30, no analgesia n = 30). Eligibility: women at 38-42 weeks' gestation, para 1 or para 2 in spontaneous labour, at 4 cm dilatation with no obstetric complications. |
| Interventions | Epidural: preload not mentioned. Epidural delivery of 12 mL of 1.5% lidocaine in 1:20000 adrenaline. Followed by top-ups of 6 ml lignocaine as needed. Phenoperidine: intravenous injection of 1 mg followed by infusion of 34 micrograms per minute, with 3l/min humidified oxygen intranasally. |
| Outcomes | Maternal: mode of delivery, blood gases and pH. Fetal/neonatal: fetal heart rate, Apgar scores, fetal blood pH and gases, umbilical artery pH. |
| Notes | Toulouse, France. Paper does not state if any women did not receive their allocated treatment. Year trial carried out not stated. |
| Allocation concealment | B – Unclear |

| | |
|--------------|---|
| Study | Head 2002 |
| Methods | Computer-generated block randomisation, stratified according to gestational age, (less than 35 weeks versus 35 weeks or longer). Numbered, sealed, opaque envelopes. Intention-to-treat analysis used. All women accounted for. |
| Participants | 116 women recruited (meperidine n = 60, epidural n = 56). Eligibility: women > 24 weeks' gestation with severe pre-eclampsia having singleton vertex presentation and at least 2 cm dilated to 6 cm cervical dilatation. |

Characteristics of included studies (Continued)

| | |
|------------------------|---|
| Interventions | <p>Epidural: preload 250-500 ml sodium lactate over 20 minutes. Epidural catheter placed in L3-L4 interspace. Test dose of 0.25% bupivacaine 3 ml, then incremental bolus doses of 3-5 ml 0.25% bupivacaine to obtain T-10 sensory level, maintained by continuous infusion of 0.125% bupivacaine with 2 microgram fentanyl at rate of 10 ml /hr.</p> <p>Meperidine: PCA intravenous meperidine dose of 10 mg and lockout interval of 10 minutes. Maximum dose of 240 mg in 6 hours also had IV promethazine 25 mg 4 hourly. All women received intravenous crystalloid 100 ml/h and magnesium sulphate 4 g bolus followed by infusion of 2 g/h till 24 hours postpartum.</p> |
| Outcomes | <p>Maternal: intrapartum visual analogue pain score, mode of delivery, woman's satisfaction with pain relief, hypotension, headache, eclampsia, acute renal dysfunction.</p> <p>Neonatal: Apgar scores, seizure, naloxone administration, neonatal intensive care admission, fetal heart rate abnormalities. umbilical cord pH, birthweight.</p> |
| Notes | <p>Alabama, USA.</p> <p>42 women in the epidural group and 41 women, in control group received opioid prior to randomisation. 25 women in epidural group and 19 women in control group received hydralazine.</p> <p>7 women did not receive their allocated treatment (5 from opioid group). 1 woman randomised opioid had epidural as well.</p> <p>1 woman randomised opioid had epidural instead.</p> <p>Year trial carried out not stated.</p> |
| Allocation concealment | A – Adequate |

Study Hogg 2000

| | |
|------------------------|---|
| Methods | <p>“Randomized clinical trial”.</p> <p>No further detail in abstract.</p> <p>Intention-to-treat analysis used. All women accounted for.</p> |
| Participants | <p>105 women recruited (epidural n = 53, meperidine n = 52).</p> <p>Eligibility: labouring women with severe pre-eclampsia at > 24 weeks' gestation.</p> |
| Interventions | Epidural analgesia versus intravenous PCA with meperidine. No further information in abstract. |
| Outcomes | <p>Maternal: caesarean section, pain score, satisfaction score, maternal ephedrine administration.</p> <p>Neonatal: naloxone administration, birthweight, cord pH, NICU admission, deaths.</p> |
| Notes | <p>Alabama. Birmingham, USA.</p> <p>8 of the 105 women did not receive assigned treatment due to rapid labour. 2 in the meperidine group received epidural as well.</p> <p>Year trial carried out not stated.</p> |
| Allocation concealment | B – Unclear |

Study Howell 2001

| | |
|---------------|---|
| Methods | <p>Computer-generated randomisation at the time of request for pain relief. Intention-to-treat analysis used. Outcome assessor for backache blinded. All women accounted for with the exception of backache (17% loss to follow up at 26 months).</p> |
| Participants | <p>369 women recruited (epidural n = 184, non-epidural n = 185). Eligibility: labouring nulliparous women at term with singleton pregnancy and cephalic presentation, with no contraindication to either forms of analgesia.</p> |
| Interventions | <p>Preload not stated. 10 ml of 0.25% bupivacaine. Followed by top-ups of 0.25% 5-10 ml as required. Pethidine: 50-100 mg intramuscular pethidine, repeated according to standard midwifery practice. Women in both groups allowed to use Entonox.</p> |
| Outcomes | <p>Maternal: mode of delivery, length of labour, use of oxytocin, maternal satisfaction with pain relief, backache, postnatal depression, not feeling in control, drowsiness, concerns regarding pain relief, catheterisation postdelivery, postnatal haemoglobin, maternal blood loss at delivery.</p> |

Characteristics of included studies (Continued)

| | |
|------------------------|---|
| | Fetal/neonatal: Apgar scores, umbilical cord pH. |
| Notes | North Staffordshire, UK. 52 (28%) women randomised non-epidural received epidural. 61 (33%) women randomised epidural did not receive it. Trial carried out 1992-1997. |
| Allocation concealment | A – Adequate |

Study Jain 2003

| | |
|------------------------|--|
| Methods | Randomisation with Tippets random number table into 3 groups. Allocation was concealed using sealed, opaque envelopes (information obtained directly from trial authors). All women accounted for. |
| Participants | 126 women recruited (epidural n = 43, meperidine n = 39, tramadol n = 44). Eligibility: nulliparous women in spontaneous labour at > 36 weeks' gestation with singleton pregnancy and cephalic presentation. Exclusion: cervical dilatation more than 5 cms, evidence of cephalic disproportion, utero placental insufficiency, any medical/surgical complications. |
| Interventions | Preload not mentioned. Test dose 0.25% bupivacaine with adrenaline 1:200 000. Followed by 10 ml bolus of 0.15% bupivacaine and 30 micrograms fentanyl. If further analgesia required after 2 hrs same bolus given. If within 2 hrs the fentanyl reduced to 15 micrograms, if > than 2 top-ups requested in 1 hr, a continuous infusion of 0.1% bupivacaine and 1 microgram fentanyl per ml is commenced at rate of 10 ml /h. Meperidine: 50-100 mg IM depending on maternal weight, repeated 4 hourly. If analgesia requested in less than 4 hrs, 1 of above dose is given. each injection of meperidine is given with 25 mg promethazine. No meperidine is given after cervical dilatation of 8 cm. Tramadol: intramuscular injection of 1 mg/kg weight and not exceeding 200 mg in 24 hrs. |
| Outcomes | Maternal: mode of delivery, pain score, maternal satisfaction with pain relief, duration of 1st and 2nd stages of labour, hypotension, urinary retention, respiratory depression, desire to use same pain relief in future. Neonatal: Apgar score, cord pH, naloxone administration. |
| Notes | Chandigarh, India. All women received assigned allocation. Year trial carried out not stated. |
| Allocation concealment | A – Adequate |

Study Long 2003

| | |
|---------------|--|
| Methods | "Randomly divided into 3 groups". No further information. Intention-to-treat analysis used. All women accounted for. |
| Participants | 80 women recruited (CSE n = 30, tramadol n = 20, no analgesia n = 30). Eligibility: women at 37-41 weeks' gestation in spontaneous, uncomplicated labour, aged between 23-32 years, ASA I-II and expected to have vaginal delivery. Exclusion: ASA physical status at least III, clinical contraindications to epidural. |
| Interventions | CSE: preload not mentioned, spinal administration of 2.5 mg ropivacaine with 5 micrograms of fentanyl. Epidural mixture of 0.1% ropivacaine and 1.5 micrograms of fentanyl PCEA infusing at 4 ml/h with PCEA dose of 4 ml and lockout time of 15 min. Tramadol: 1 mg/kg loading dose IV followed by PCIA with 0.75% tramadol. PCA dose of 2 ml infusing at 2 ml/hr with 10 min lockout, maximum dose of 400 mg. 5 mg navoban given IV to prevent nausea and vomiting. 3rd group received no analgesia. |
| Outcomes | Maternal: pain scores, motor block assessed with modified Bromage score, duration of 1st and 2nd stages of labour, caesarean section, sedation, nausea and vomiting, urinary retention, post- dural puncture headache. Neonatal: Apgar score. |

Characteristics of included studies (Continued)

| | |
|------------------------|---|
| Notes | Beijing, China. Paper does not state if any women did not receive their allocated treatment. Year trial carried out not stated. |
| Allocation concealment | B – Unclear |
| Study | Loughnan 2000 |
| Methods | Computerised random-number allocation, sealed, opaque envelopes. Intention-to-treat analysis used; however, backache (at 6 months) analysed on data of women who responded to questionnaire only. Secondary analysis based on actual analgesia received. All women accounted for with the exception of backache (17% loss to follow up at 6 months). |
| Participants | 616 women recruited (epidural n = 304, pethidine n = 310). Eligibility: nulliparous women with term singleton pregnancy, cephalic presentation, in spontaneous or induced labour, with no evidence of cephalic pelvic disproportion. Exclusion: any medical/obstetric complications. |
| Interventions | Epidural: 0.25% bupivacaine 10 ml followed by infusion of 0.125% bupivacaine at 10 ml/hour until 2nd stage. Lignocaine 2% was administered for instrumental or caesarean delivery. Pethidine: 100 mg IM injection. |
| Outcomes | Maternal: mode of delivery, long-term backache, duration of 1st and 2nd stages of labour, oxytocin augmentation, pain scores. Neonatal: admission to NICU. |
| Notes | Northwick Park, England. 86 (28%) women randomised to pethidine received epidural as well. 89 (29%) of women received pethidine received epidural instead and 3 used entonox. 13 (4%) women randomised to epidural received pethidine as well, 44 (14%) received pethidine alone and 3 used entonox alone. Trial carried out 1992-1995. |
| Allocation concealment | A – Adequate |
| Study | Lucas 2001 |
| Methods | Computerised-generated numbers, in opaque, sealed envelopes. Intention-to-treat analysis used. All women accounted for. |
| Participants | 738 women randomised (epidural n = 372, meperidine PCA n = 366). Eligibility: parous and nulliparous women with pregnancy induced hypertension (diastolic at least 90 mmHg) in spontaneous or induced labour. 20 women in the epidural group and 18 in the control group had gestation < 36 weeks. Exclusion: chronic hypertension, or received any analgesia/sedation prior. |
| Interventions | Epidural: preload with 500 ml sodium lactate. Epidural analgesia achieved with boluses of 0.25% bupivacaine to T10 level of sensory analgesia, followed by continuous infusion of 0.125% bupivacaine with 2 mg/ml of fentanyl titrated to maintain analgesia. Meperidine: IV bolus of 50 mg meperidine with 25 mg promethazine followed by PCA infusion up to 15 mg every 10 minutes. All women received a loading dose of intramuscular magnesium sulphate 10 g and maintenance dose of 5 g every 4 hr to prevent eclampsia. |
| Outcomes | Maternal: duration of 1st and 2nd stages of labour, hypotension, fever, oxytocin augmentation, mode of delivery, ephedrine use, pulmonary oedema, postpartum oliguria, postpartum weight loss. Neonatal: Apgar scores, umbilical artery pH, naloxone administration, birthweight, NICU, ventilation/24 hrs. |
| Notes | Texas, USA. 3 women in each group required additional analgesia. |

Characteristics of included studies (Continued)

Trial carried out 1996-1998.

Allocation concealment A – Adequate

Study Morgan-Ortiz 1999

Methods “Randomised into 2 groups”, no further information given. Intention-to-treat analysis used.

Participants 129 women recruited (epidural n = 69, no analgesia n = 63).
Eligibility: primiparous women in 'beginning of active phase of labour'.

Interventions Epidural bupivacaine versus no analgesia. No further information in abstract.

Outcomes Maternal: duration of 1st and 2nd stages of labour, pain scores.
Neonatal: Apgar scores, Silverman score.Notes Sinaloa, Mexico.
Paper does not state if any women did not receive their allocated treatment.
Trial carried out 1997-1998.

Allocation concealment B – Unclear

Study Muir 1996

Methods Women “prospectively randomised”, no further information given.

Participants 50 women recruited (epidural n = 28, meperidine n = 22).
Eligibility: uncomplicated primiparous women in spontaneous labour.Interventions Epidural method: preload not stated.
Bupivacaine 0.125% with adrenaline, 10-15 ml, plus pethidine 25 mg, followed by PCA (bupivacaine 0.125% with adrenaline plus pethidine 0.5 mg/ml, 4 ml boluses, lockout 15 minutes).
Second stage: epidural use not stated.
Control method: intravenous pethidine by PCA pump (up to 1 mg/Kg loading dose, followed by 10 mg boluses, lockout 10 minutes).Outcomes Maternal: pain scores, motor and sensory block, duration of labour, cervical dilation, use of oxytocin, mode of delivery, maternal satisfaction, temperature.
Neonatal: Apgar score, cord pH < 7.15 (epidural 1/28, control 2/22) and NACS score at 2 and 24 hrs.Notes Canada.
11 (50%) women randomised to meperidine received epidural.
An additional 3 women were enrolled into the trial, all were excluded for technical or equipment failures (group not stated).
Year trial carried out not stated.

Allocation concealment B – Unclear

Study Muir 2000Methods Participants randomly assigned to receive PCEA or PCIA. Computer-generated random number system concealed in consecutively numbered sealed, opaque envelopes (further information was obtained directly from trial authors).
Intention-to-treat analysis was used. All women accounted.Participants 185 women recruited (epidural = 97, IV fentanyl = 88).
Eligibility: healthy, nulliparous, spontaneous labour, requesting analgesia.
Exclusions: any condition known to increase incidence of operative delivery.Interventions Epidural: 0.08% bupivacaine + 1.67 mcg/ml fentanyl - loading dose of 10-15 ml followed by 5 ml every 10 minutes prn.
IV fentanyl - loading dose of 1-2 ug followed by 50 ug every 10 minutes PRN.

Characteristics of included studies (Continued)

| | |
|------------------------|---|
| Outcomes | Maternal: pain scores, satisfaction with analgesia, need for further analgesia, duration of analgesia, caesarean section rate. Infant: Apgar scores, NICU admission, cord pH, neuro adaptive scores, cord fentanyl levels, |
| Notes | Canada. Multicentre trial. 18 (20%) women in the IV fentanyl group received an epidural also. Year trial carried out not stated. |
| Allocation concealment | A – Adequate |

Study Nikkola 1997

| | |
|------------------------|---|
| Methods | “Randomised” method not specified. Intention-to-treat analysis used. All women were accounted for. |
| Participants | 20 women recruited (epidural n = 10, fentanyl n = 10). Healthy primigravidas, aged 20-35 years. Exclusion: complications of pregnancy, regular use of drugs and chronic disease. |
| Interventions | Epidural: preload unknown. 6 ml 0.5% bupivacaine initially. Intermittent top-ups with 4 ml (only 1st stage). IV narcotic: fentanyl 50 mg initially. PCA delivered. 20 mg boluses (only 1st stage). |
| Outcomes | Maternal: visual analogue pain score, side-effects, length of labour after analgesia, mode of delivery, heart rate, oxygen saturation. Fetal/neonatal: CTG variability, Apgar score, cord pH arterial and venous, Amiel-Tison’s neurological score, birthweight. |
| Notes | Finland. 4 (40%) women randomised to fentanyl received epidural as well. |
| Allocation concealment | B – Unclear |

Study Philipsen 1989

| | |
|------------------------|--|
| Methods | “Randomly assigned by random numbers, contained in sealed, consecutively opened envelopes”. One woman in non-epidural group lost to follow up. Intention-to-treat analysis used. |
| Participants | 112 women recruited (epidural n = 57, pethidine n = 55). Eligibility: 37-42 weeks’ gestation, no medical/obstetric abnormality, in early spontaneous labour, no scars on uterus, 104/112 primiparous. |
| Interventions | Epidural method: preload given. Bupivacaine 0.375% (1 ml per 10 kg) by intermittent top-up. T10-L1 block. Second stage: epidural use discontinued. Control method: pethidine 75 mg IM (x 1-2), nitrous oxide/oxygen inhalation, or pudendal block (20 ml mepivacaine) in second stage. |
| Outcomes | Maternal: pain, hypotension, nausea and vomiting, urinary retention, sleepiness, motor blockade, length of first stage of labour, duration of second stage of labour, position of fetal head at delivery, mode of delivery, maternal memory of labour. Fetal/ neonatal: fetal heart rate abnormality, Apgar score (median (range), at 1 min: epidural 10 (4-10) n = 57; control 9 (4-10) n = 54; at 5 min: epidural 10 (8-10) n = 57; control 10 (7-10) n = 54), cord venous pH (median (range): epidural 7.23 (7.0-7.4) n = 57; control 7.23 (7.0-7.4) n = 54), neurobehavioral abnormalities. |
| Notes | Denmark. 9 (16%) women randomised epidural and 29 (53%) women randomised pethidine had entonox also. Year trial carried out not stated. |
| Allocation concealment | B – Unclear |

Characteristics of included studies (Continued)

| Study | Sharma 1997 |
|------------------------|---|
| Methods | Randomised sequence was computer derived in blocks of 20, with numbered, opaque sealed envelopes. Intention-to-treat analysis used. All women accounted for. |
| Participants | 715 women recruited (epidural n = 358, IV meperidine analgesia n = 357). Eligibility: mixed parity women in spontaneous labour at term. |
| Interventions | Epidural: preload given. Continuous infusion with 0.125% bupivacaine with 2 ug/ml fentanyl. 68% complied with protocol. IV narcotic: PCA with meperidine. Additional doses given on request. |
| Outcomes | Maternal: visual analogue pain scores, length of labour, oxytocin augmentation, fever > 38 degrees centigrade, mode of delivery. Fetal/ neonatal: meconium in labour, non reassuring CTG, Apgar scores, cord pH, naloxone, NICU. |
| Notes | Texas, USA. 8 (2%) women randomised epidural received meperidine instead. 5 (1%) women randomised meperidine received epidural as well. Trial carried out 1995-1996. |
| Allocation concealment | A – Adequate |

| Study | Sharma 2002 |
|------------------------|--|
| Methods | Computer-generated randomisation numbers in opaque, sealed envelopes. Intention-to-treat analysis used. All women accounted for. |
| Participants | 459 women recruited (epidural n = 226, meperidine n = 233). Eligibility: nulliparous, singleton, at term, spontaneous labour, cephalic presentation. |
| Interventions | Epidural: preload given 500 ml sodium lactate. Test dose of 3 ml of 1% lidocaine with epinephrine, then 0.25% bupivacaine in 3 ml increments till T-10 sensory level analgesia. Then infusion of 0.0625% bupivacaine with 2 microgram/ml fentanyl at 6 ml/h with 5 ml boluses every 15 min prn using PCA pump. Meperidine: 50 mg IV with 25 mg promethazine followed by PCA pump delivering 15 mg meperidine every 15 min until delivery. Additional 25 mg are given on request, maximum of 100 mg in 2 hr. |
| Outcomes | Maternal: fever, hypotension, oxytocin augmentation, instrumental delivery Infant: Apgar scores, umbilical artery pH, fetal heart abnormalities, birthweight. |
| Notes | Texas, USA. 24 women (12 in each group) received another form of analgesia. An additional 14 women in the meperidine group received epidural as well. Trial carried out 1998-2000. |
| Allocation concealment | A – Adequate |

| Study | Thalme 1974 |
|---------------|---|
| Methods | “Randomly allotted”, using sealed envelopes drawn by a midwife. Intention-to-treat analysis used. All women accounted for. |
| Participants | 28 women recruited (epidural n = 14, meperidine n = 14). Eligibility: nulliparous women aged 18-35 years at 37-41 weeks’ gestation in spontaneous labour with no medical or obstetric complications. |
| Interventions | Epidural method: preload given. Bupivacaine 0.25% with adrenaline 6-8 ml by intermittent top-up. Level of block not known. Second stage: epidural use continued. Control method: pethidine 100 mg x 1 (route not stated), chlorpromazine 12.5 mg x 1, then Entonox, pudendal block for delivery using 20 mls 1% prilocaine. |
| Outcomes | Maternal: duration of 1st and 2nd stages of labour, oxytocin augmentation, acid/base values, mode of delivery. |

Fetal/neonatal: fetal heart rate abnormality, meconium, acid/base values, Apgar scores, blood chemistry, Silverman-Anderson score to assess breathing performance, rectal temperature.

| | |
|------------------------|--|
| Notes | Sweden. Paper did not state if any women did not receive their allocated treatment. Year trial carried out not stated. |
| Allocation concealment | B – Unclear |

| Study | Thorp 1993 |
|---------------|--|
| Methods | Randomised to treatment by sealed envelopes. Randomisation sequence derived from a computer-generated random number table. Intention-to-treat analysis used. All women accounted for. |
| Participants | 93 women recruited (epidural n = 48, control n = 45). Eligibility: uncomplicated pregnancies at 37-42 weeks' gestation, spontaneous labour, nulliparous women. |
| Interventions | Epidural method. Preload not mentioned. Bupivacaine 0.25% bolus dose followed by 0.25% bupivacaine infusion. Block to T10-T12. Second stage: epidural use continued. Control: 75 mg pethidine and 25 mg promethazine intravenously every 90 minutes as required. |
| Outcomes | Maternal: length of first and second stages of labour, oxytocin augmentation, method of delivery, pain scores. Fetal/neonatal: presence of meconium, Apgar scores, umbilical cord blood gases, neurologic adaptive capacity score. |
| Notes | United States of America. 1 woman randomised narcotic received epidural as well. 1 woman randomised epidural never received it. Trial terminated early following preliminary analysis, showing increase in caesarean delivery in epidural group. |

Allocation concealment B – Unclear

ASA: American Society of Anesthesiologist

BE: base excess

CSE: Combined spinal-epidural

CTG: cardiotocography

hr: hour

IM: intramuscular

IV: intravenous

NACS: Neurological Adaptive Capacity Score

NICU: neonatal intensive care unit

PCA: participant-controlled analgesia

PCEA: participant-controlled epidural analgesia

PCIA: participant-controlled intravenous analgesia

PIH: pregnancy-induced hypertension

PRN: when required

TENS: transcutaneous electrical nerve stimulation

VAS: visual analogue scores

Characteristics of excluded studies

| Study | Reason for exclusion |
|-------------|--|
| Abboud 1982 | This study was designed to assess the effect on beta-endorphin levels, of momentarily withholding local anaesthetic after insertion of the catheter into the epidural space. |
| Buchan 1973 | Excluded because the method of randomisation was not adequate (alternate allocation). Epidural bupivacaine (n = 10) compared with intramuscular pethidine (n = 10). Outcomes include corticosteroid levels and mode of delivery. |

| | |
|----------------|---|
| Ginosar 2002 | Excluded because all women received epidural bupivacaine till pain free (n = 48) then to randomised to IV fentanyl or epidural fentanyl. |
| Hood 1993 | Excluded because both experiment and control group had regional procedure although saline was control. This study compared epidural bupivacaine (n = 14) with epidural saline (n = 14) for 60 minutes after insertion of the epidural catheter. The outcome of interest was fetal heart rate changes. |
| Jouppila 1976 | Excluded because the method of randomisation was not adequate (alternate allocation). Epidural bupivacaine (n = 14) compared with intramuscular pethidine (n = 14). Outcomes include duration of labour, growth hormone, insulin, fetal/infant outcomes and mode of delivery. |
| Jouppila 1980 | Excluded because the method of randomisation was not adequate (alternate allocation). Epidural bupivacaine (n = 8) compared with intramuscular pethidine (n = 10). Outcomes include duration of labour, prolactin, fetal/infant outcomes and mode of delivery. |
| Justins 1983 | Excluded because all participants were given epidural test dose followed by either intramuscular fentanyl or epidural fentanyl. Outcomes included duration of analgesia, hypotension, itching, bladder dysfunction and neonatal Apgar scores in correlation with plasma fentanyl concentration. |
| Kurjak 1974 | Quasi-randomised. Epidural bupivacaine n = 224, control group n = 224 (conventional analgesia). Most participants in the control group had pethidine 150 mg /4 h. The rest had nitrous oxide or no analgesia. Outcomes include maternal and umbilical arterial blood acid-base status, fetal heart rate changes, fetal blood pH, Apgar scores |
| Lassner 1981 | Excluded because study compared epidural morphine (n = 13) with epidural saline (n = 12), with both groups receiving epidural bupivacaine at some stage in labour. |
| Leong 2000 | Not RCT. All participants were offered epidural analgesia in labour and those who accepted formed the epidural group (n = 55), those who declined epidural analgesia were controls (n = 68). Outcomes included duration of labour, oxytocin augmentation and mode of delivery. |
| MacKenzie 1996 | All participants had epidural bupivacaine in labour prior to randomisation to continuous infusion of epidural bupivacaine and fentanyl (n = 7) or intravenous fentanyl (n = 6). Outcomes included fentanyl concentration in maternal and cord blood. |
| McGrath 1992 | The study randomised participants to epidural analgesia or nalbuphine intravenously with the intention of providing all women with epidural analgesia later in labour. The outcome of interest was fetal heart rate changes in the first hour after randomisation. |
| Neri 1986 | Quasi-randomised (information from authors) n = 104. This study compared epidural analgesia (n = 52) with apresoline and magnesium sulphate (n = 52) in the management of women with pre-eclampsia. Outcomes include change in blood pressure, mode of delivery, Apgar scores, neonatal jaundice and respiratory depression at birth. |
| Noble 1971 | Excluded because the method of randomisation was not adequate (allocation by case record number). Epidural bupivacaine (n = 125) compared with intramuscular pethidine (n = 120). Outcomes include duration of labour, maternal hypotension, fetal/infant outcomes and mode of delivery. |
| Revill 1979 | Excluded because more than 28% of women excluded from analysis. Out of 386 randomised only 132 completed interviews in their allocated groups. Outcomes include pain scores, satisfaction with analgesia, and concerns of analgesic effects on the baby. |
| Robinson 1980 | Excluded because more than 30% of women excluded from analysis. Out of approximately 300 women initially randomised at antenatal visit into the 2 groups, only 93 completed the interviews having used only the analgesic allocated to them. The large proportion excluded compromises the reliability of the results. Epidural bupivacaine (n = 45) was compared with intramuscular pethidine (n = 48). Outcomes include duration of labour, mode of delivery and maternal pain/discomfort, nausea, sleepiness, backache, satisfaction and worry over baby. |
| Robinson 1997 | Intention-to-treat analysis not used. 153 participants randomly allocated to low extra-dural analgesia with 0.125% bupivacaine with 50 ug fentanyl followed by 0.1% bupivacaine with 2 ug/ml fentanyl top-ups (n = 89), and IM pethidine 100 mg (n = 64). |

Characteristics of excluded studies (Continued)

| | |
|----------------|---|
| | Outcomes were pain relief scores, mode of delivery, duration of 1st and 2nd stages of labour. |
| Ryhanen 1984 | Excluded because the method of randomisation was not adequate (alternate allocation). Epidural bupivacaine (n = 5) compared with intramuscular pethidine (n = 5). Outcomes include duration of labour, plasma leukocyte counts, fetal/infant outcomes. |
| Swanstrom 1981 | Quasi-randomised (running order). 80 women. Epidural n = 37, paracervical n = 16, control group n = 27 (further data from authors). Outcomes include duration of 1st and 2nd stages of labour, oxytocin augmentation, Apgar scores, neonatal jaundice, neurological outcomes at 6/18 months. |
| Zakowski 1994 | Excluded because compared epidural morphine to IV morphine postoperative analgesia in women who had elective caesarean delivery. All participants had received epidural lidocaine preoperatively, epidural morphine (n = 8) IV morphine (n = 8). Outcomes were plasma and urinary morphine concentration. |

h: hours

IM: intramuscular

IV: intravenous

RCT: randomised controlled trial

ANALYSES

Comparison 01. Epidural versus non-epidural analgesia in labour

| Outcome title | No. of studies | No. of participants | Statistical method | Effect size |
|---|----------------|---------------------|--|-------------------------|
| 01 Woman's perception of pain relief in labour | 1 | 105 | Weighted Mean Difference (Fixed) 95% CI | -2.60 [-3.82, -1.38] |
| 02 Instrumental delivery | 17 | 6162 | Relative Risk (Fixed) 95% CI | 1.38 [1.24, 1.53] |
| 03 Caesarean section | 20 | 6534 | Relative Risk (Fixed) 95% CI | 1.07 [0.93, 1.23] |
| 04 Apgar score less than 7 at 5 minutes | 14 | 5363 | Relative Risk (Fixed) 95% CI | 0.70 [0.44, 1.10] |
| 05 Maternal satisfaction with pain relief in labour | 5 | 1940 | Relative Risk (Random) 95% CI | 1.18 [0.92, 1.50] |
| 06 Long-term backache | 2 | 814 | Relative Risk (Fixed) 95% CI | 1.00 [0.89, 1.12] |
| 07 Length of first stage of labour (minutes) | 9 | 2328 | Weighted Mean Difference (Random) 95% CI | 23.81 [-18.88, 66.51] |
| 08 Length of second stage of labour (minutes) | 11 | 3580 | Weighted Mean Difference (Random) 95% CI | 15.55 [7.46, 23.63] |
| 09 Oxytocin augmentation | 11 | 4551 | Relative Risk (Random) 95% CI | 1.18 [1.03, 1.34] |
| 10 Caesarean section for fetal distress | 10 | 4421 | Relative Risk (Fixed) 95% CI | 1.42 [0.99, 2.03] |
| 11 Caesarean section for dystocia | 11 | 4606 | Relative Risk (Fixed) 95% CI | 0.90 [0.73, 1.12] |
| 12 Time of administration of pain relief to time pain relief was satisfactory | 1 | 82 | Weighted Mean Difference (Fixed) 95% CI | -6.70 [-8.02, -5.38] |
| 13 Woman's perception of pain relief during 1st stage of labour | 2 | 164 | Weighted Mean Difference (Fixed) 95% CI | -15.67 [-16.98, -14.35] |
| 14 Woman's perception of pain relief during the 2nd stage of labour | 2 | 164 | Weighted Mean Difference (Fixed) 95% CI | -20.75 [-22.50, -19.01] |
| 15 Maternal satisfaction with childbirth experience | 1 | 332 | Relative Risk (Fixed) 95% CI | 0.95 [0.87, 1.03] |
| 16 Perceived feeling of poor control in labour | 1 | 344 | Relative Risk (Fixed) 95% CI | 1.17 [0.62, 2.21] |
| 17 Need for additional means of pain relief | 15 | 6019 | Relative Risk (Random) 95% CI | 0.05 [0.02, 0.17] |

| | | | | |
|---|---|------|-------------------------------|----------------------|
| 19 Maternal hypotension as defined by trial authors | 7 | 2759 | Relative Risk (Random) 95% CI | 20.09 [4.83, 83.64] |
| 20 Postnatal depression (authors definition, on medication, or self-reported) | 1 | 313 | Relative Risk (Fixed) 95% CI | 0.63 [0.38, 1.05] |
| 22 Motor blockade | 3 | 322 | Relative Risk (Fixed) 95% CI | 31.71 [4.16, 241.99] |
| 23 Respiratory depression requiring oxygen administration | 1 | 122 | Relative Risk (Fixed) 95% CI | Not estimable |
| 25 Headache | 2 | 206 | Relative Risk (Fixed) 95% CI | 0.96 [0.67, 1.40] |
| 28 Perineal trauma requiring suturing | 1 | 369 | Relative Risk (Fixed) 95% CI | 1.05 [0.93, 1.18] |
| 29 Nausea and vomiting | 7 | 2355 | Relative Risk (Fixed) 95% CI | 1.03 [0.87, 1.22] |
| 30 Itch | 1 | 80 | Relative Risk (Fixed) 95% CI | 4.94 [0.21, 117.42] |
| 31 Fever > 38 degrees C | 3 | 1912 | Relative Risk (Fixed) 95% CI | 3.67 [2.77, 4.86] |
| 32 Shivering | 1 | 20 | Relative Risk (Fixed) 95% CI | 5.00 [0.27, 92.62] |
| 33 Drowsiness | 3 | 414 | Relative Risk (Random) 95% CI | 1.00 [0.12, 7.99] |
| 34 Urinary retention | 3 | 283 | Relative Risk (Fixed) 95% CI | 17.05 [4.82, 60.39] |
| 35 Catheterisation during labour | 2 | 1103 | Relative Risk (Random) 95% CI | 1.81 [0.44, 7.46] |
| 37 Malposition | 4 | 673 | Relative Risk (Fixed) 95% CI | 1.40 [0.98, 1.99] |
| 38 Surgical amniotomy | 2 | 211 | Relative Risk (Random) 95% CI | 1.03 [0.74, 1.43] |
| 39 Neonatal intensive care unit admission | 7 | 3125 | Relative Risk (Fixed) 95% CI | 1.19 [0.94, 1.50] |
| 40 Umbilical artery pH < 7.2 at delivery | 6 | 2774 | Relative Risk (Fixed) 95% CI | 0.80 [0.66, 0.96] |
| 41 Acidosis defined by cord arterial pH < 7.15 | 2 | 382 | Odds Ratio (Fixed) 95% CI | 0.94 [0.46, 1.91] |
| 42 Naloxone administration | 8 | 2373 | Relative Risk (Fixed) 95% CI | 0.13 [0.08, 0.21] |
| 46 Meconium staining of liquor | 4 | 1426 | Relative Risk (Fixed) 95% CI | 1.01 [0.79, 1.30] |

Comparison 02. Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed)

| Outcome title | No. of studies | No. of participants | Statistical method | Effect size |
|---|----------------|---------------------|------------------------------|-------------------|
| 01 Instrumental vaginal delivery | 17 | 6162 | Relative Risk (Fixed) 95% CI | 1.38 [1.24, 1.53] |
| 02 Caesarean section | 20 | 6534 | Relative Risk (Fixed) 95% CI | 1.07 [0.93, 1.23] |
| 03 Apgar score less than 7 at 5 minutes | 14 | 5363 | Odds Ratio (Fixed) 95% CI | 0.69 [0.43, 1.11] |

Comparison 03. Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation

| Outcome title | No. of studies | No. of participants | Statistical method | Effect size |
|---|----------------|---------------------|-------------------------------|-------------------|
| 01 Instrumental delivery | 12 | 4168 | Relative Risk (Fixed) 95% CI | 1.66 [1.41, 1.94] |
| 02 Caesarean section | 14 | 4355 | Relative Risk (Fixed) 95% CI | 1.09 [0.91, 1.31] |
| 03 Apgar score less than 7 at 5 minutes | 10 | 3983 | Relative Risk (Fixed) 95% CI | 0.56 [0.31, 1.01] |
| 04 Maternal satisfaction with pain relief in labour | 3 | 923 | Relative Risk (Random) 95% CI | 1.23 [0.97, 1.55] |

| | | | | |
|-----------------------|---|-----|------------------------------|-------------------|
| 05 Long-term backache | 1 | 306 | Relative Risk (Fixed) 95% CI | 1.05 [0.92, 1.20] |
|-----------------------|---|-----|------------------------------|-------------------|

Comparison 04. Sensitivity analysis of primary outcomes based on trial quality

| Outcome title | No. of studies | No. of participants | Statistical method | Effect size |
|--|----------------|---------------------|---|-------------------|
| 01 Woman's perception of pain relief in labour | 0 | 0 | Weighted Mean Difference (Fixed) 95% CI | Not estimable |
| 02 Instrumental delivery | 10 | 4547 | Relative Risk (Random) 95% CI | 1.47 [1.21, 1.78] |
| 03 Caesarean section | 11 | 4734 | Relative Risk (Fixed) 95% CI | 1.02 [0.88, 1.19] |
| 04 Apgar score less than 7 at 5 minutes | 8 | 3807 | Relative Risk (Fixed) 95% CI | 0.72 [0.45, 1.18] |
| 05 Women satisfied with pain relief | 4 | 1920 | Relative Risk (Random) 95% CI | 1.17 [0.89, 1.52] |

Comparison 05. Subgroup analysis based on epidural technique (epidural without spinal compared to CSE)

| Outcome title | No. of studies | No. of participants | Statistical method | Effect size |
|---|----------------|---------------------|-------------------------------|-------------------|
| 01 Instrumental delivery | 17 | 6162 | Relative Risk (Fixed) 95% CI | 1.38 [1.24, 1.53] |
| 02 Caesarean section | 19 | 6165 | Relative Risk (Fixed) 95% CI | 1.09 [0.94, 1.25] |
| 03 Apgar score less than 7 at 5 minutes | 14 | 5363 | Relative Risk (Fixed) 95% CI | 0.70 [0.44, 1.10] |
| 04 Women satisfied with their pain relief | 5 | 1940 | Relative Risk (Random) 95% CI | 1.18 [0.92, 1.50] |

INDEX TERMS

Medical Subject Headings (MeSH)

*Analgesia, Epidural [adverse effects]; *Analgesia, Obstetrical [adverse effects]; *Delivery, Obstetric; *Labor, Obstetric; *Labor Pain; Randomized Controlled Trials; Risk

MeSH check words

Female; Humans; Pregnancy

COVER SHEET

| | |
|---------------------------------------|--|
| Title | Epidural versus non-epidural or no analgesia in labour |
| Authors | Anim-Somuah M, Smyth R, Howell C |
| Contribution of author(s) | C Howell (CH) prepared the first version of the review. M Anim-Somuah (MA) is responsible for this current update. MA and R Smyth (RS) updated the Background and Methods sections, assessed new studies for inclusion and extracted all the data independently. MA entered the data into RevMan and RS double checked them. MA and RS interpreted the results individually and together wrote the Results, Discussion and Conclusions. CH commented on the revised version. |
| Issue protocol first published | 1996/2 |
| Review first published | 1998/1 |
| Date of most recent amendment | 24 August 2005 |

**Date of most recent
SUBSTANTIVE amendment**

16 August 2005

What's New

August 2005

Title changed to 'Epidural versus non-epidural or no analgesia in labour' in order to reflect the changes in clinical practice.

New search conducted in June 2005, as a result of which this update includes 12 new studies (Dickinson 2002; Hogg 2000; Gambling 1998; Grandjean 1979; Head 2002; Howell 2001; Jain 2003; Long 2003; Lucas 2001; Morgan-Ortiz 1999; Muir 2000; Sharma 2002). Swanstrom 1981 which was included in the previous version has now been excluded and Ramin 1995 included in the previous version is awaiting further assessment.

Trials comparing all modalities of epidural (including combined-spinal-epidural) to non-regional analgesia or no pain relief were included.

New outcomes added to this update include maternal satisfaction with pain relief, maternal satisfaction with childbirth, breastfeeding, mother-baby bonding, some rare but serious potential adverse effects of epidural analgesia, long-term neonatal complications and economic outcomes. We performed sensitivity analysis based on excluding trials with more than 30% of women not receiving allocated analgesia or received another form of analgesia in addition (primary outcomes only). We performed additional subgroup analyses.

**Date new studies sought but
none found**

Information not supplied by author

**Date new studies found but not
yet included/excluded**

Information not supplied by author

**Date new studies found and
included/excluded**

30 June 2005

**Date authors' conclusions
section amended**

Information not supplied by author

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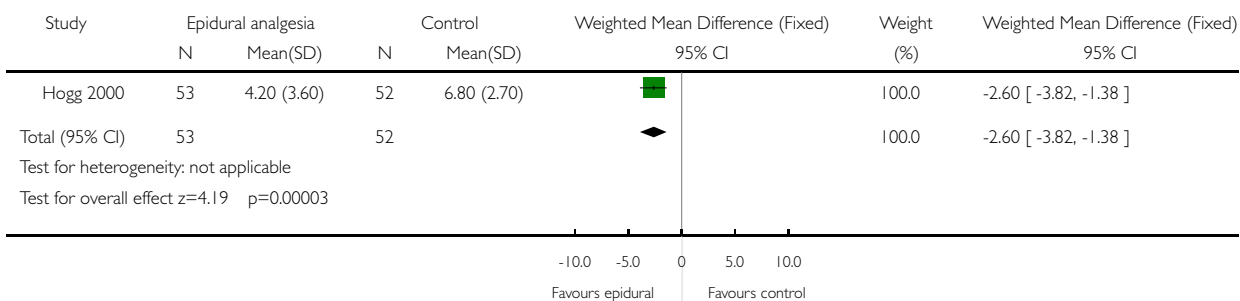
GRAPHS AND OTHER TABLES

Analysis 01.01. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 01 Woman's perception of pain relief in labour

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 01 Woman's perception of pain relief in labour

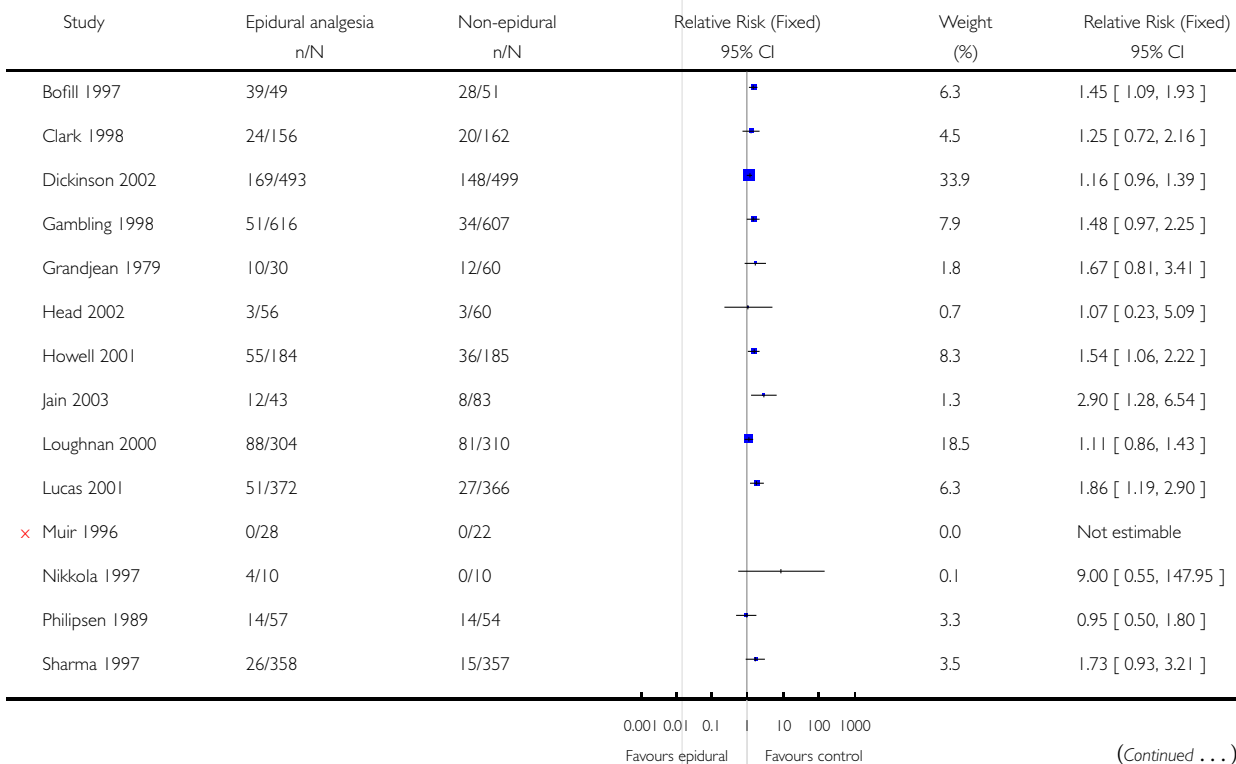


Analysis 01.02. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 02 Instrumental delivery

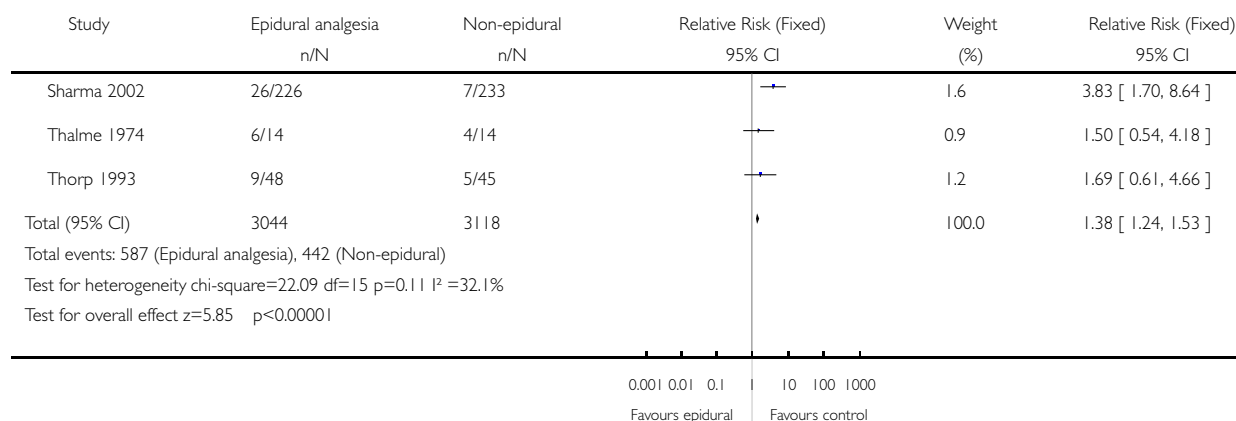
Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 02 Instrumental delivery



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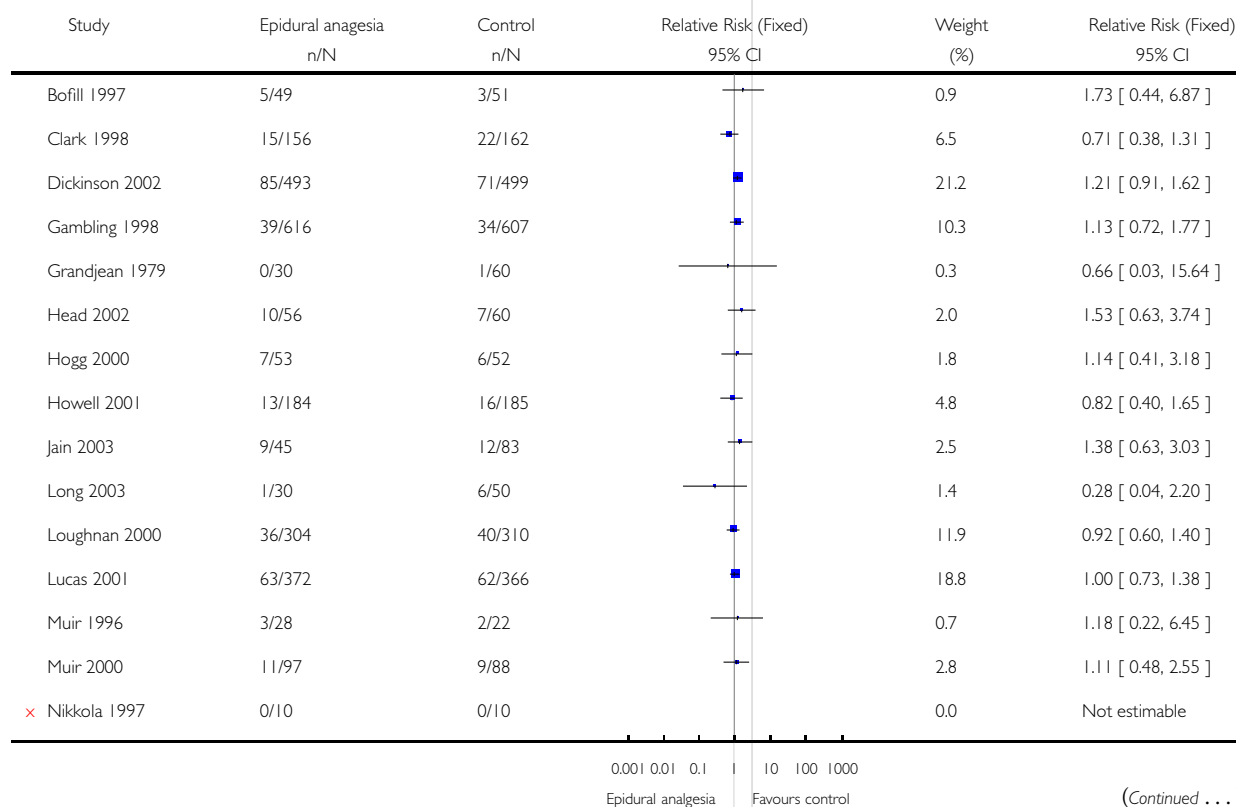


Analysis 01.03. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 03 Caesarean section

Review: Epidural versus non-epidural or no analgesia in labour

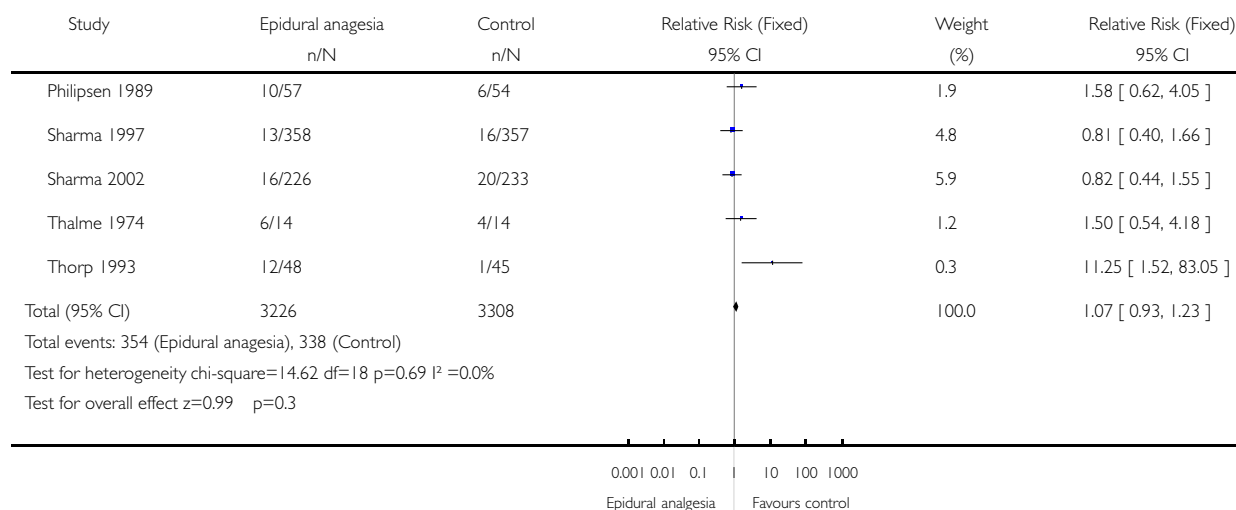
Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 03 Caesarean section



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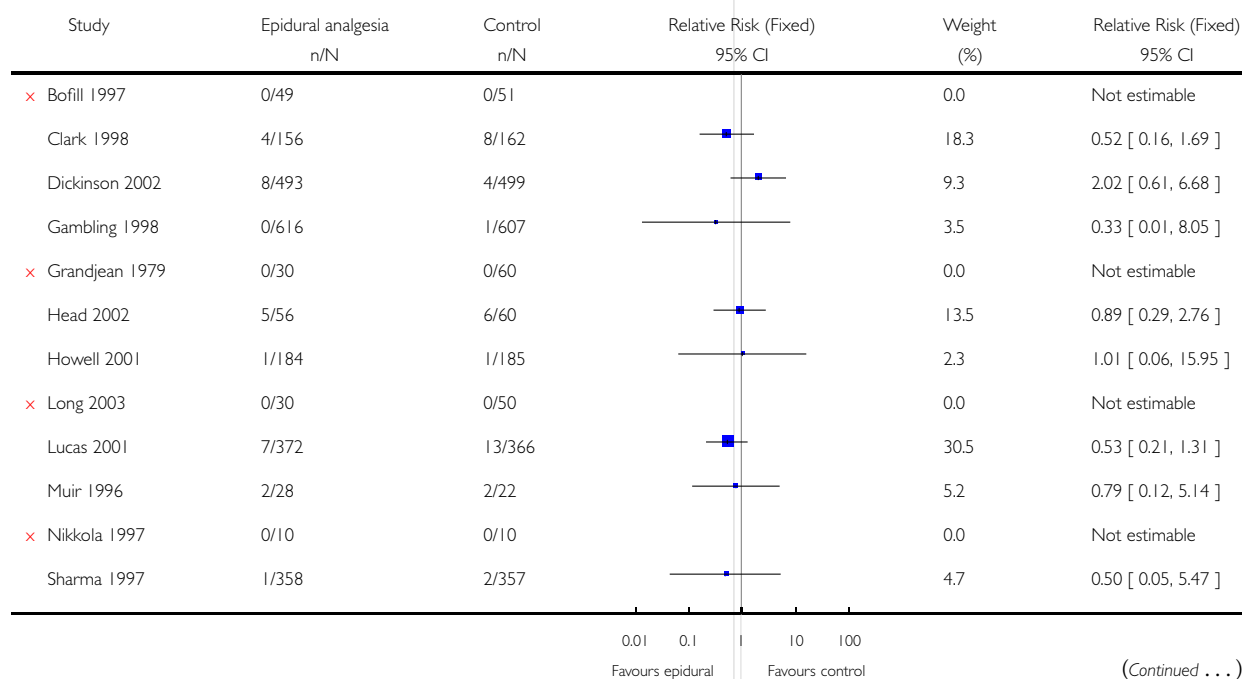


Analysis 01.04. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 04 Apgar score less than 7 at 5 minutes

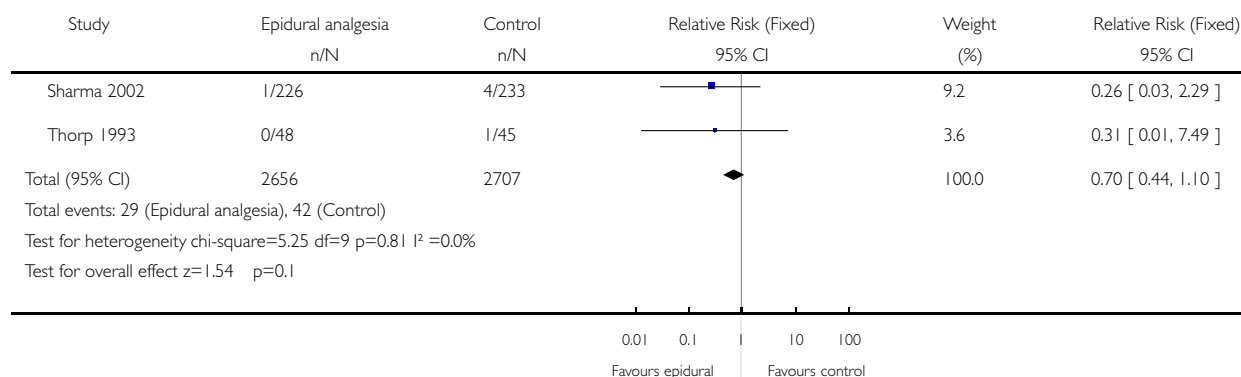
Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 04 Apgar score less than 7 at 5 minutes

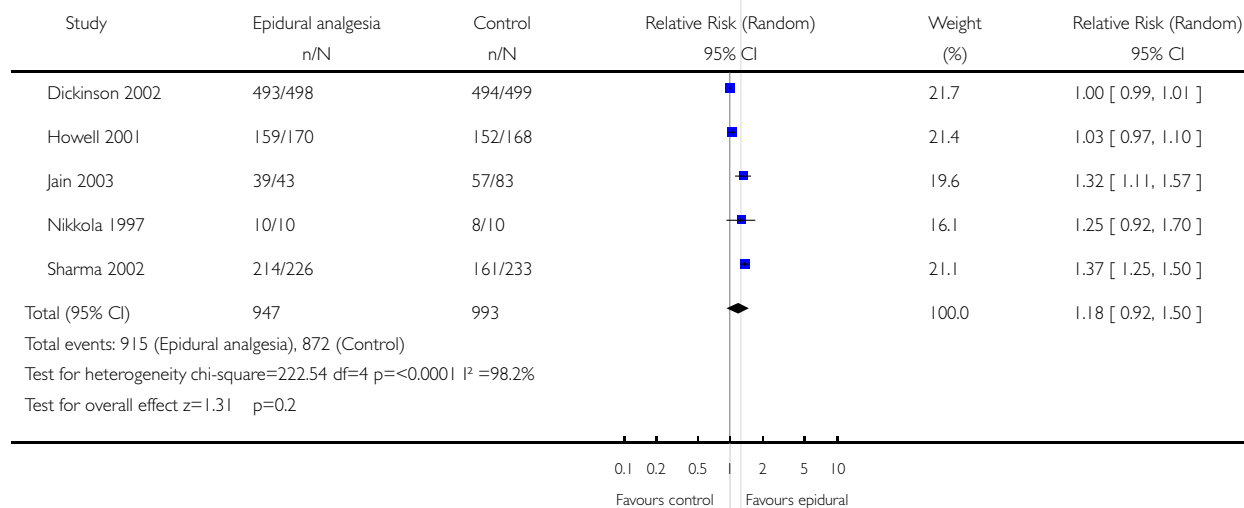


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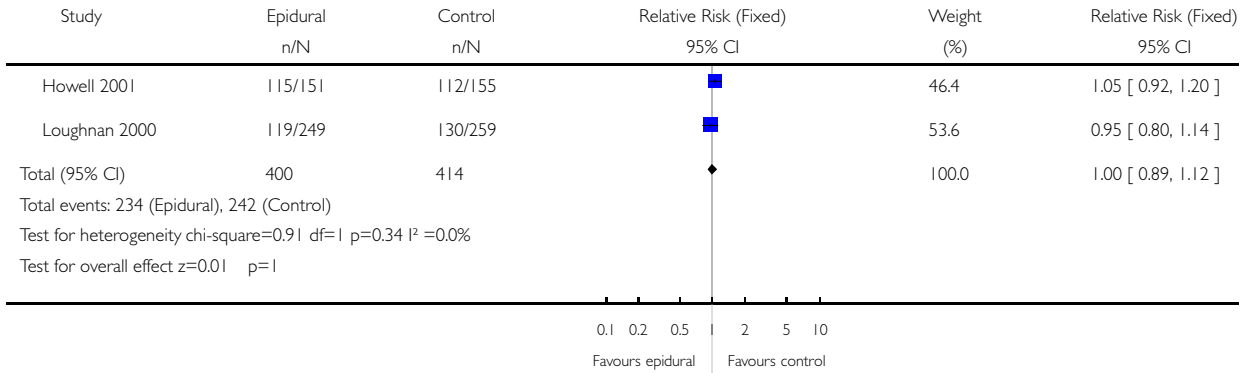
Analysis 01.05. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 05 Maternal satisfaction with pain relief in labour

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 05 Maternal satisfaction with pain relief in labour



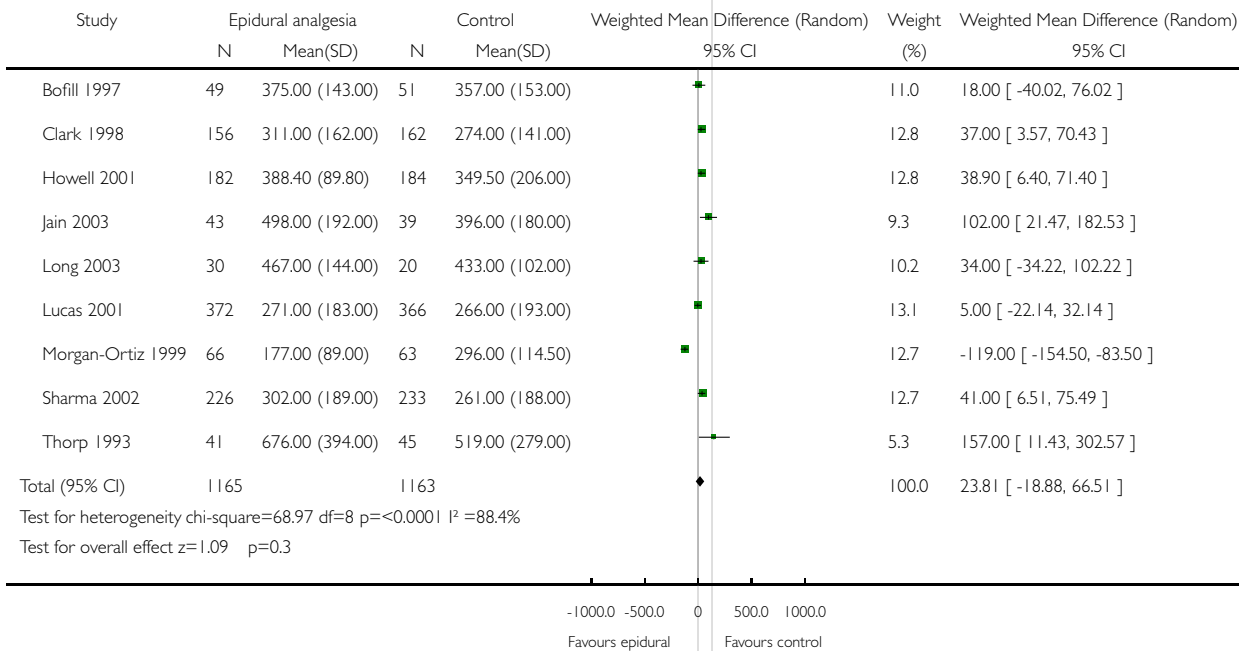
Analysis 01.06. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 06 Long-term backache

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 06 Long-term backache



Analysis 01.07. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 07 Length of first stage of labour (minutes)

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 07 Length of first stage of labour (minutes)

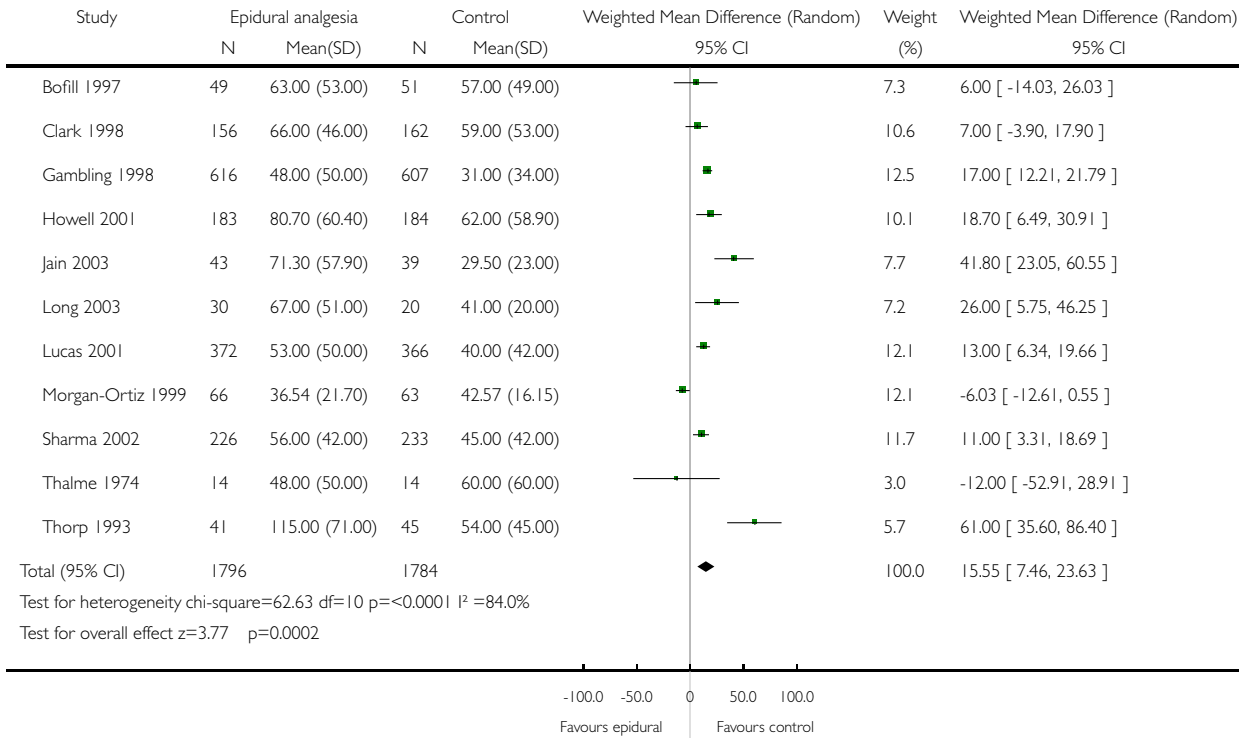


Analysis 01.08. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 08 Length of second stage of labour (minutes)

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 08 Length of second stage of labour (minutes)

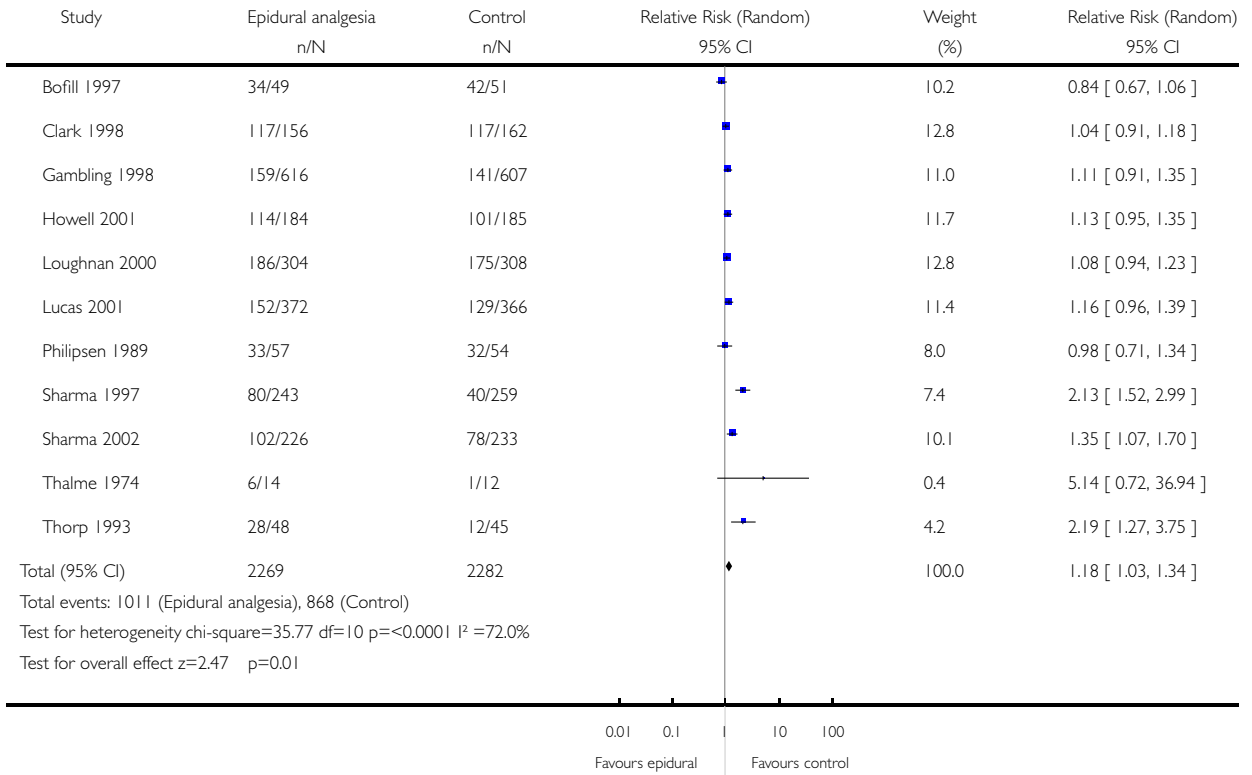


Analysis 01.09. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 09 Oxytocin augmentation

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 09 Oxytocin augmentation

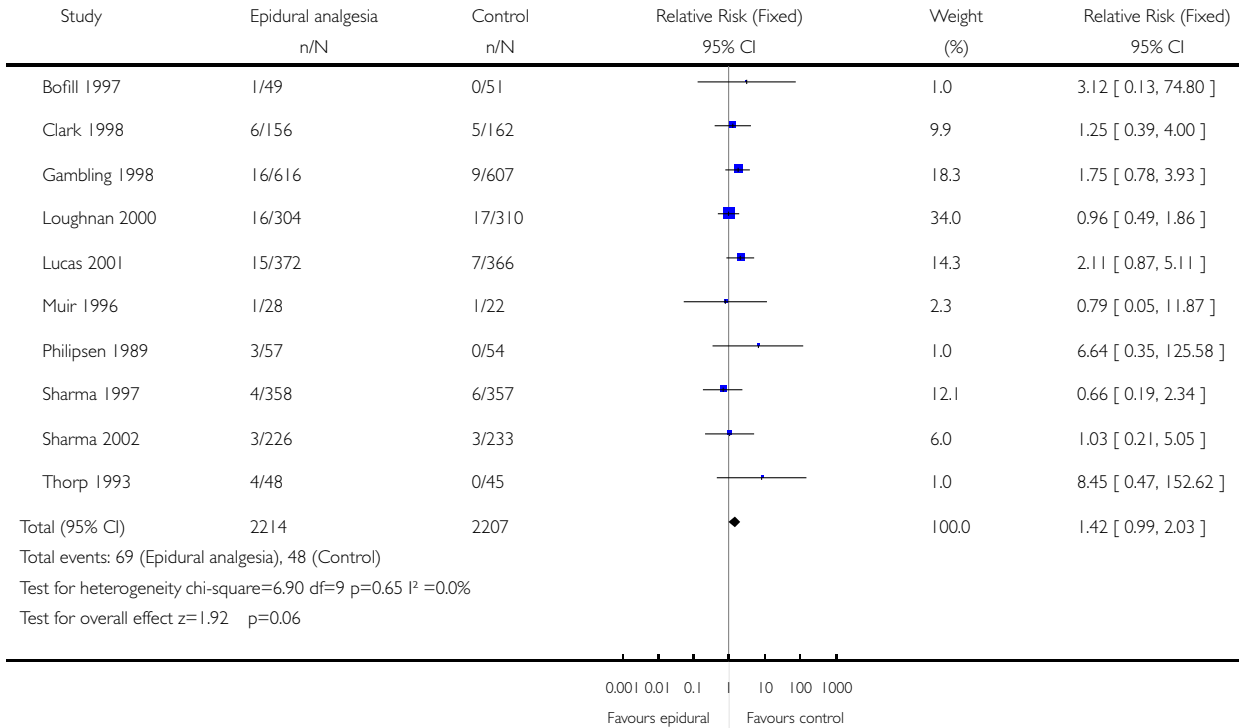


Analysis 01.10. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 10 Caesarean section for fetal distress

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 10 Caesarean section for fetal distress

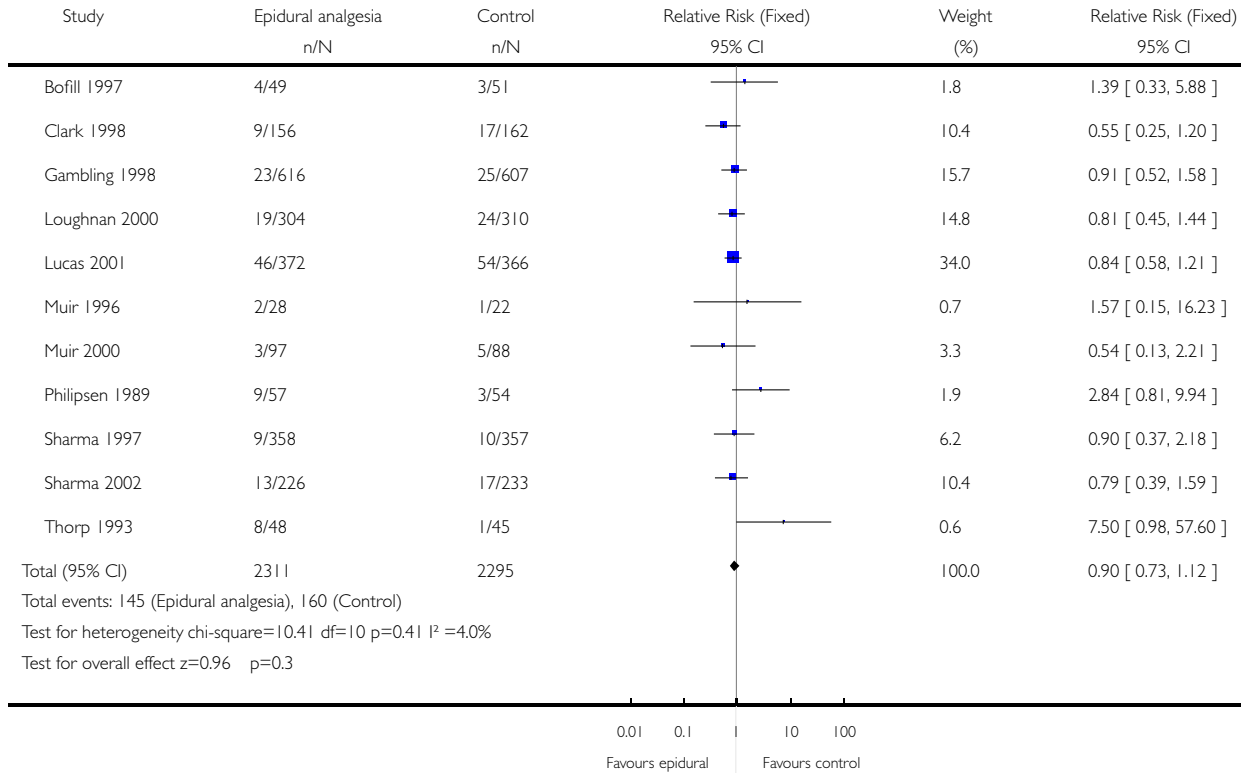


Analysis 01.11. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 11 Caesarean section for dystocia

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 11 Caesarean section for dystocia

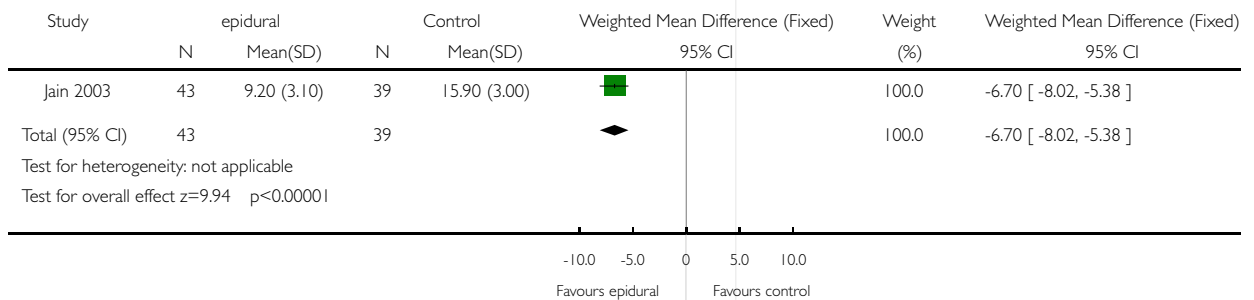


Analysis 01.12. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 12 Time of administration of pain relief to time pain relief was satisfactory

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 12 Time of administration of pain relief to time pain relief was satisfactory

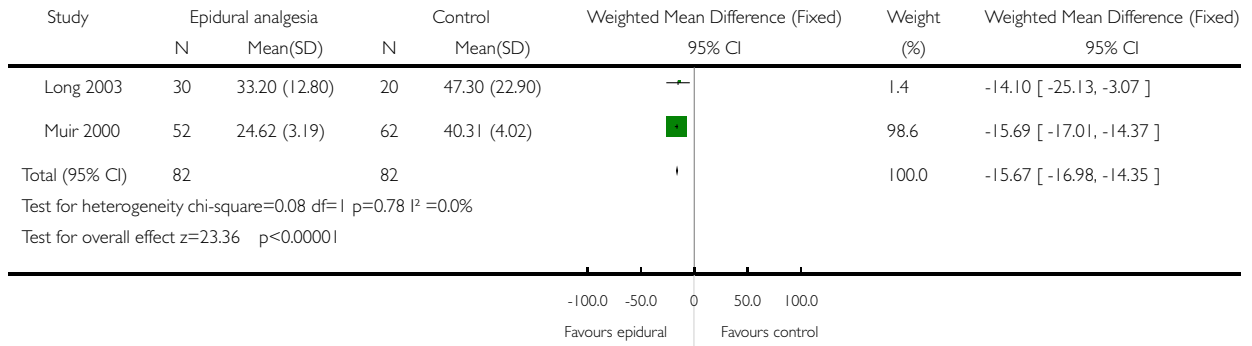


Analysis 01.13. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 13 Woman's perception of pain relief during 1st stage of labour

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 13 Woman's perception of pain relief during 1st stage of labour

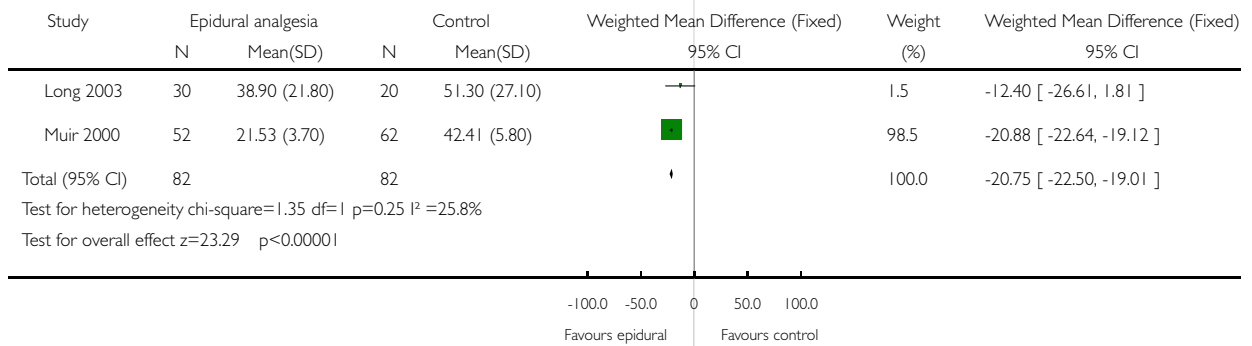


Analysis 01.14. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 14 Woman's perception of pain relief during the 2nd stage of labour

Review: Epidural versus non-epidural or no analgesia in labour

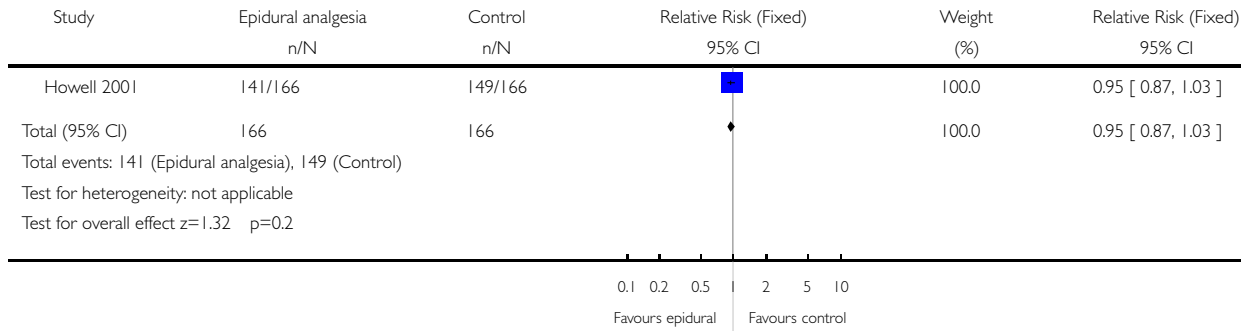
Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 14 Woman's perception of pain relief during the 2nd stage of labour



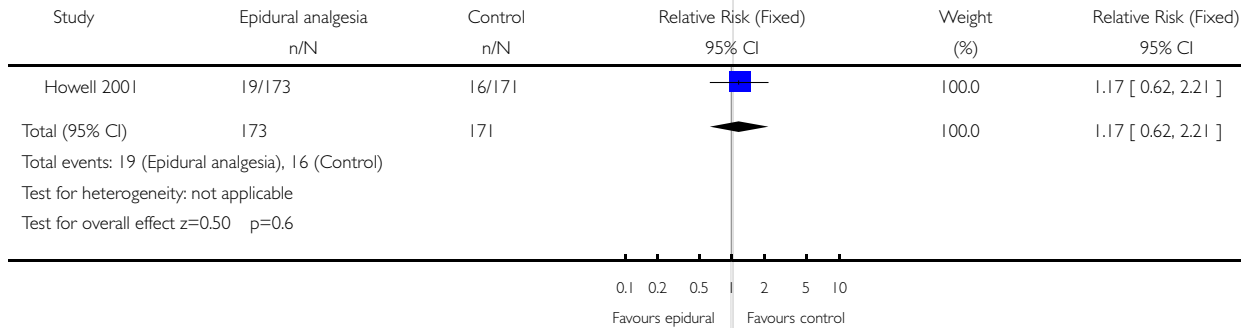
Analysis 01.15. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 15 Maternal satisfaction with childbirth experience

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 15 Maternal satisfaction with childbirth experience



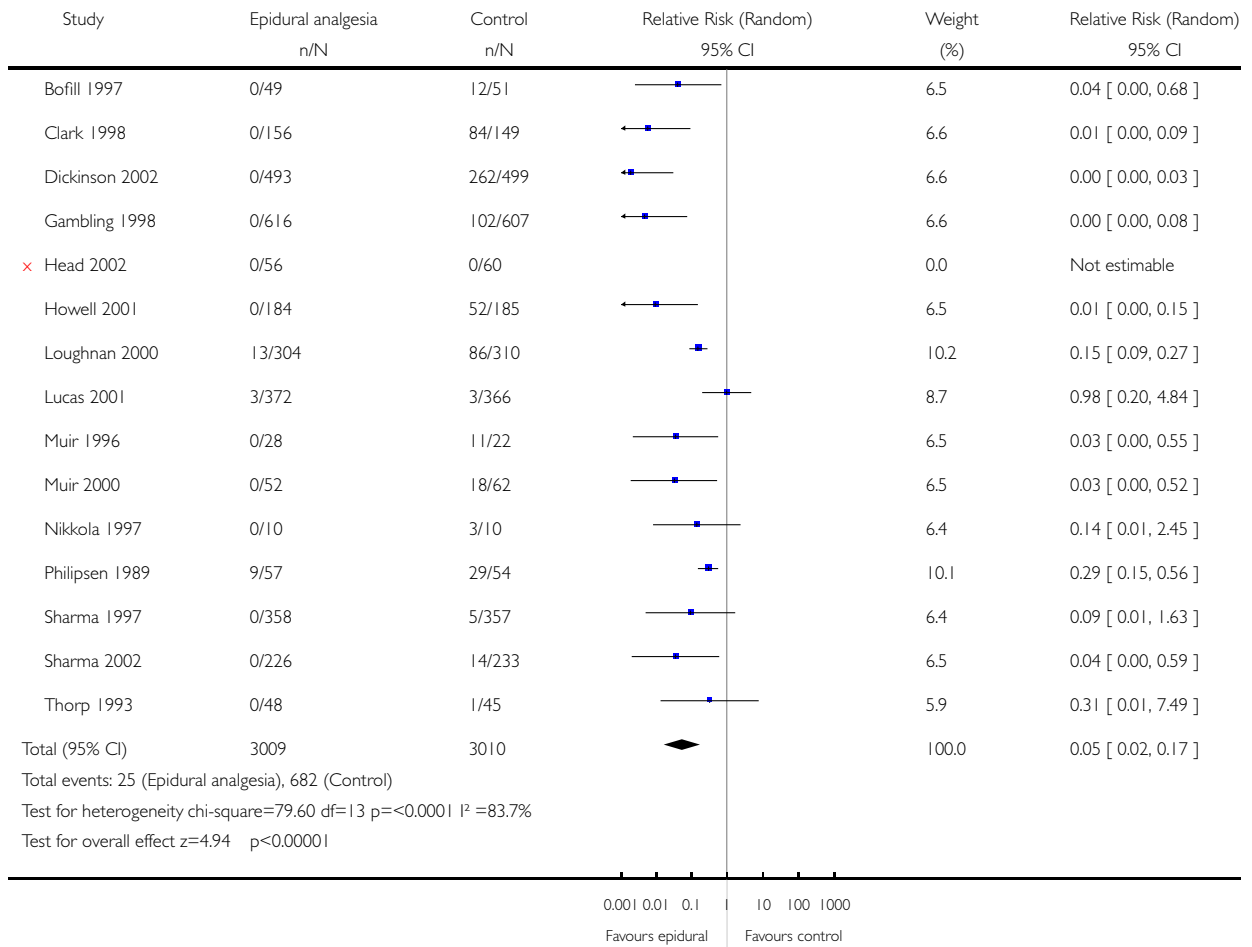
Analysis 01.16. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 16 Perceived feeling of poor control in labour

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 16 Perceived feeling of poor control in labour



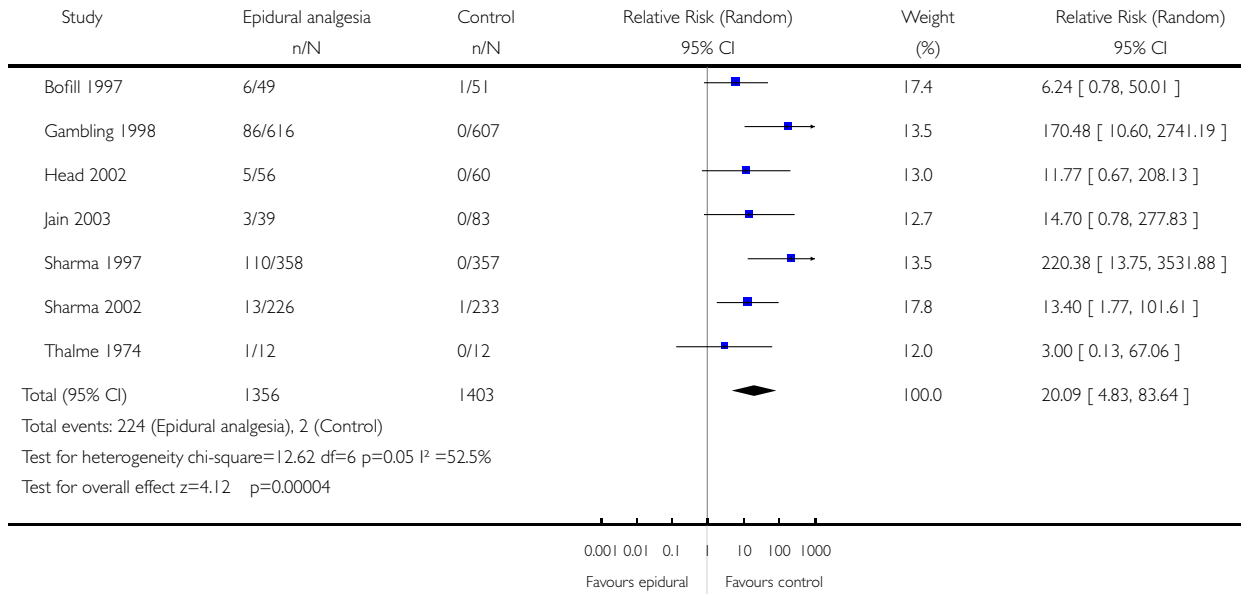
Analysis 01.17. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 17 Need for additional means of pain relief

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 17 Need for additional means of pain relief



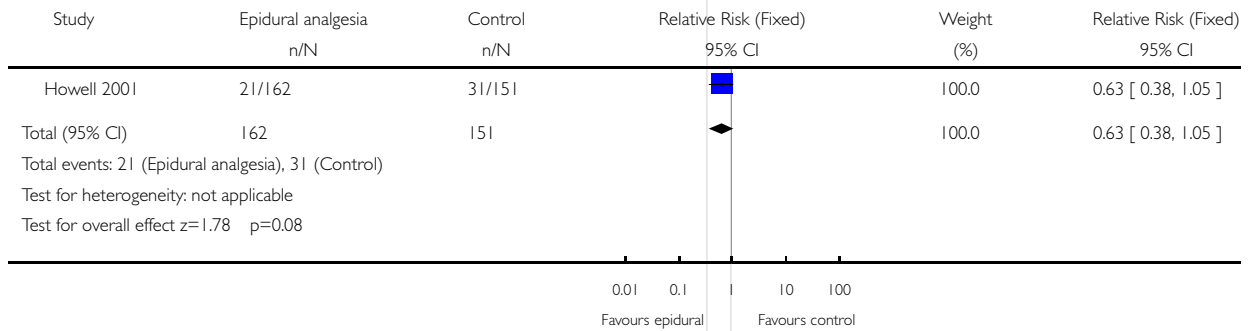
Analysis 01.19. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 19 Maternal hypotension as defined by trial authors

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 19 Maternal hypotension as defined by trial authors



Analysis 01.20. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 20 Postnatal depression (authors definition, on medication, or self-reported)

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 20 Postnatal depression (authors definition, on medication, or self-reported)

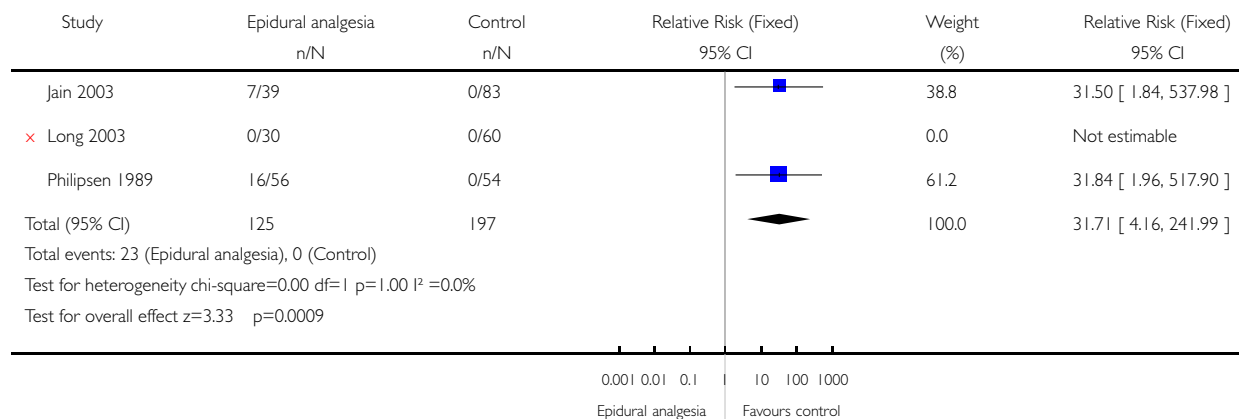


Analysis 01.22. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 22 Motor blockade

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 22 Motor blockade

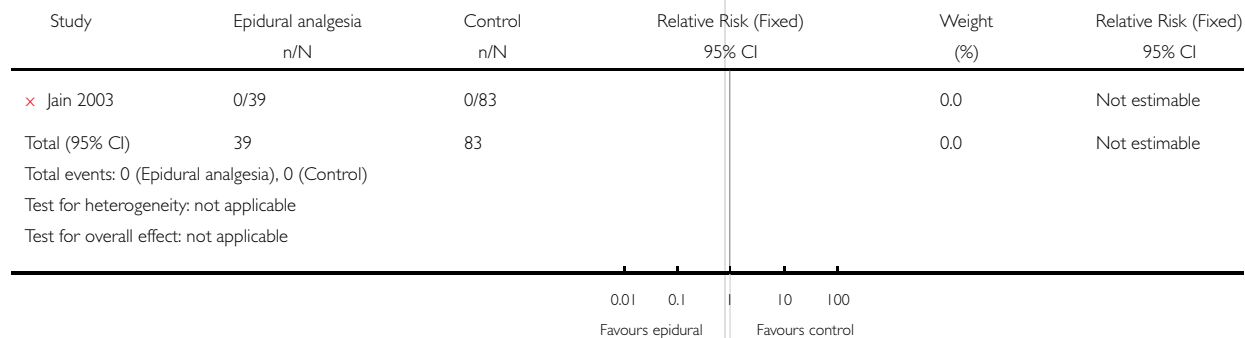


Analysis 01.23. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 23 Respiratory depression requiring oxygen administration

Review: Epidural versus non-epidural or no analgesia in labour

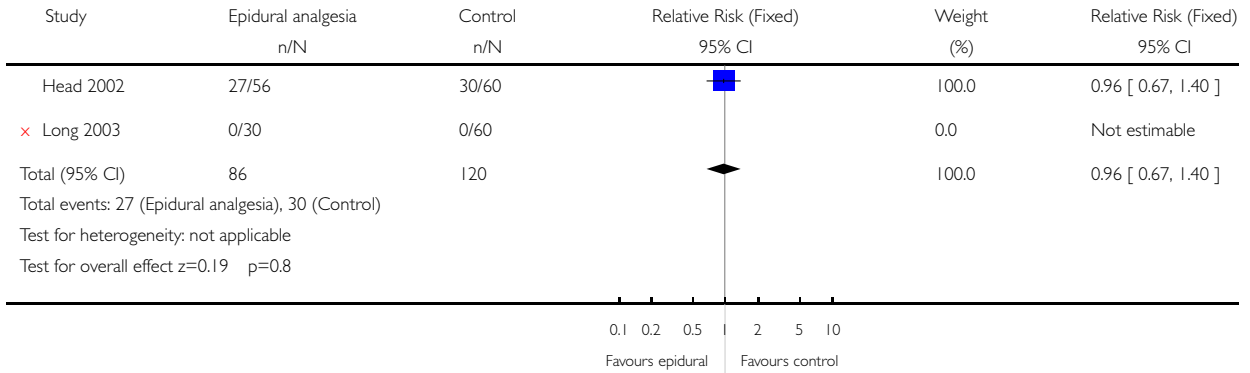
Comparison: 01 Epidural versus non-epidural analgesia in labour

Outcome: 23 Respiratory depression requiring oxygen administration



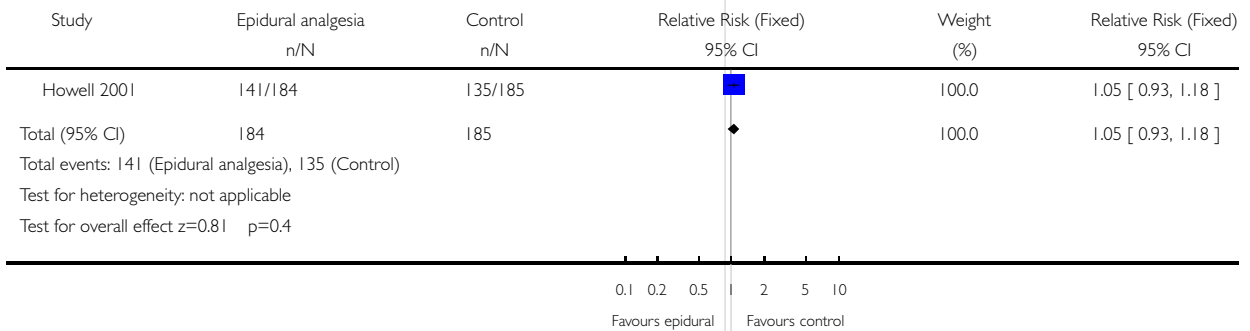
Analysis 01.25. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 25 Headache

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 25 Headache



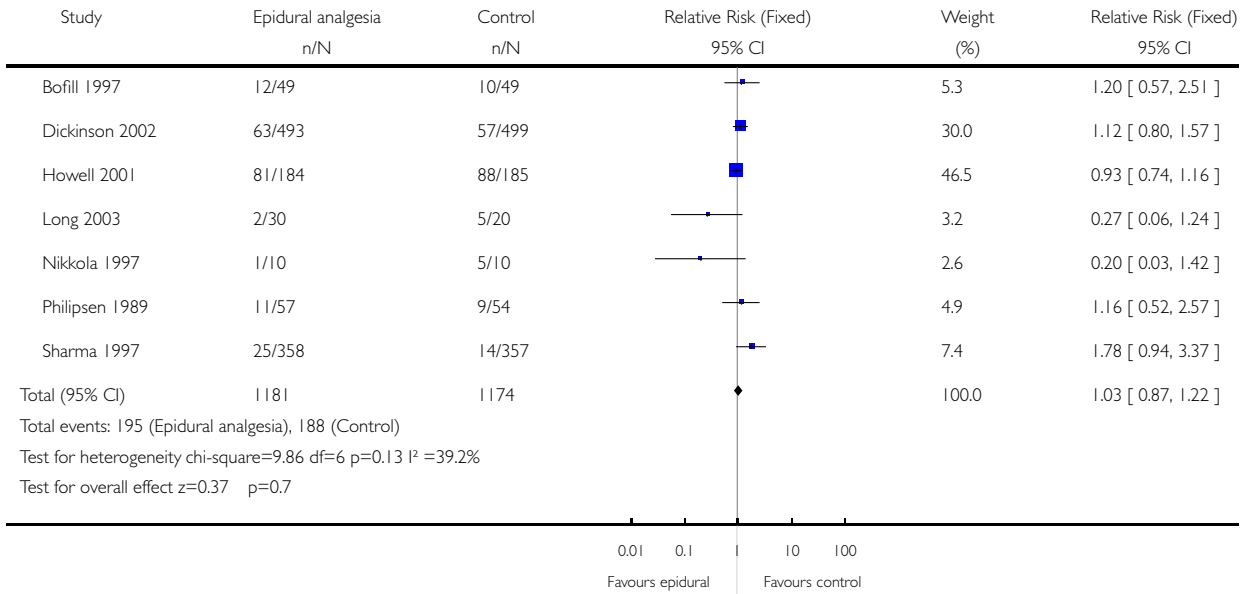
Analysis 01.28. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 28 Perineal trauma requiring suturing

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 28 Perineal trauma requiring suturing



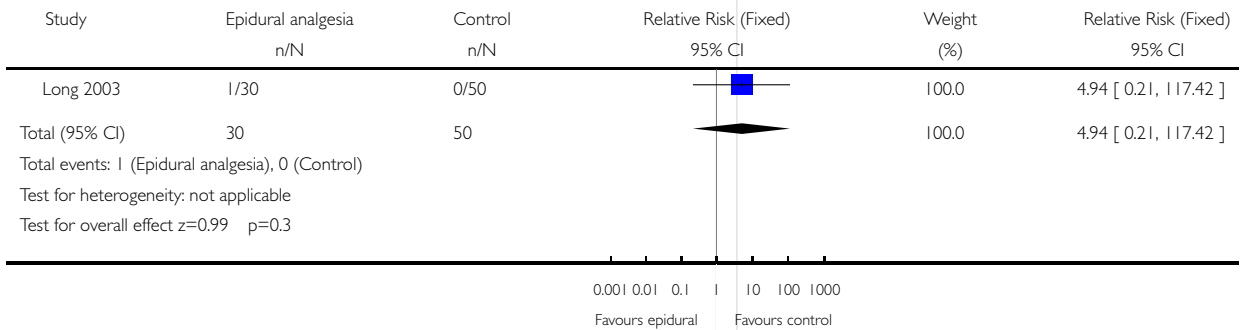
Analysis 01.29. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 29 Nausea and vomiting

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 29 Nausea and vomiting



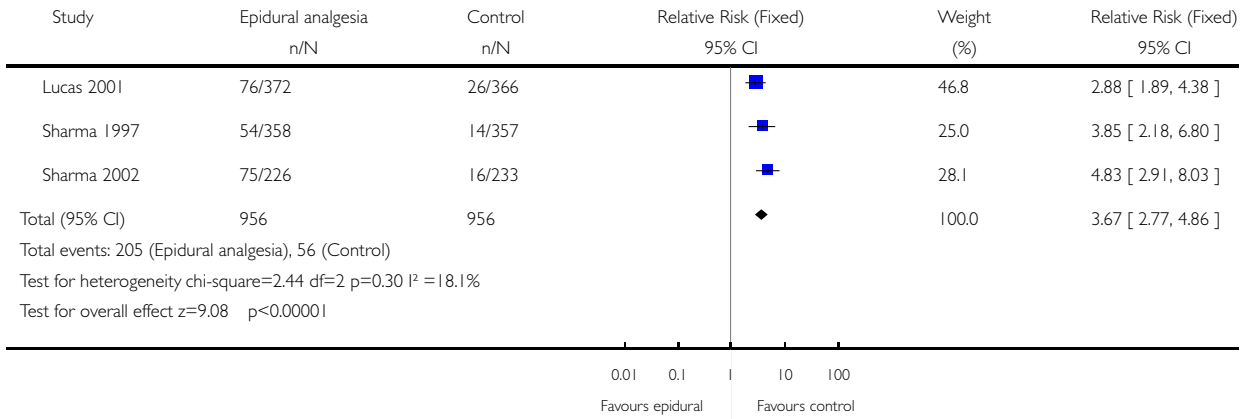
Analysis 01.30. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 30 Itch

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 30 Itch



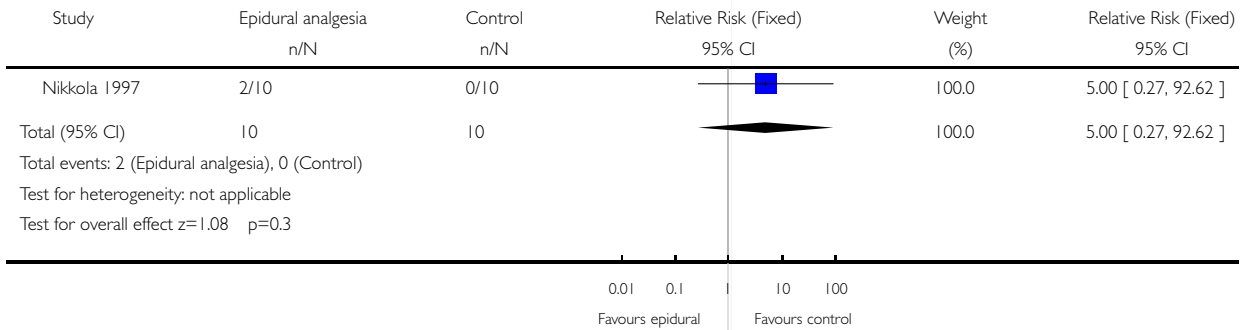
Analysis 01.31. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 31 Fever > 38 degrees C

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 31 Fever > 38 degrees C



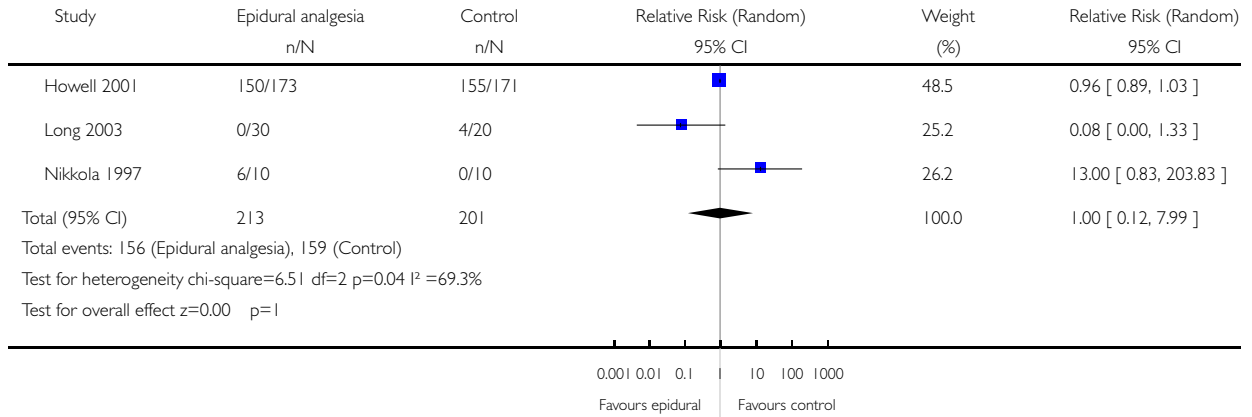
Analysis 01.32. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 32 Shivering

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 32 Shivering



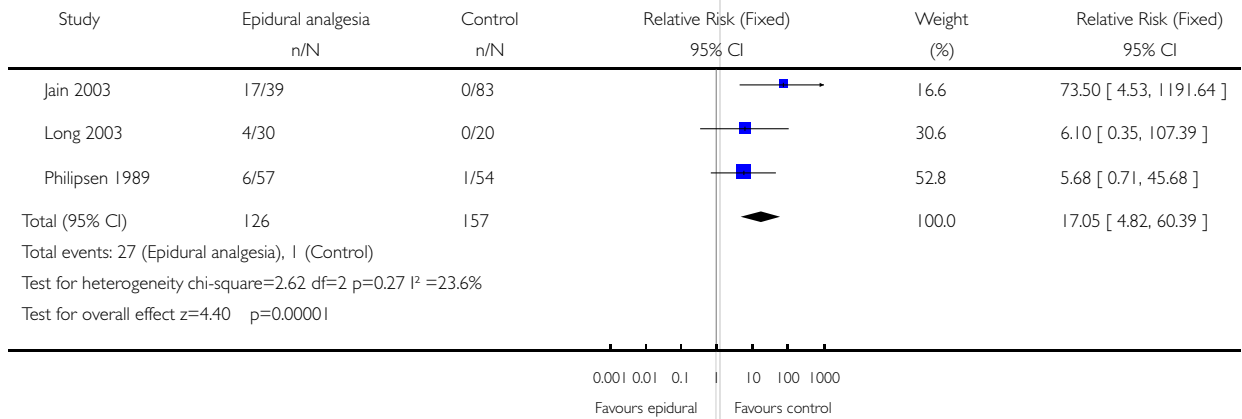
Analysis 01.33. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 33 Drowsiness

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 33 Drowsiness



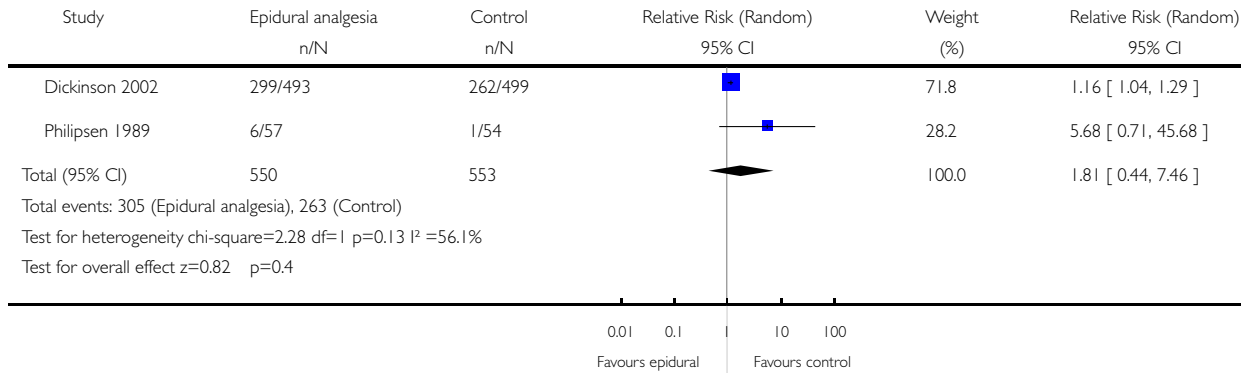
Analysis 01.34. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 34 Urinary retention

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 34 Urinary retention



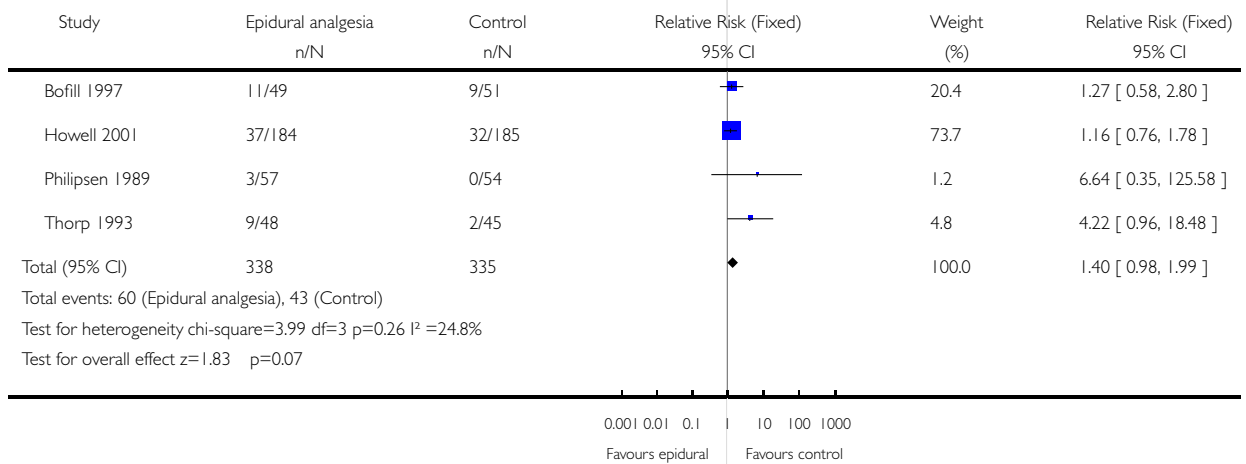
Analysis 01.35. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 35 Cathetherisation during labour

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 35 Cathetherisation during labour



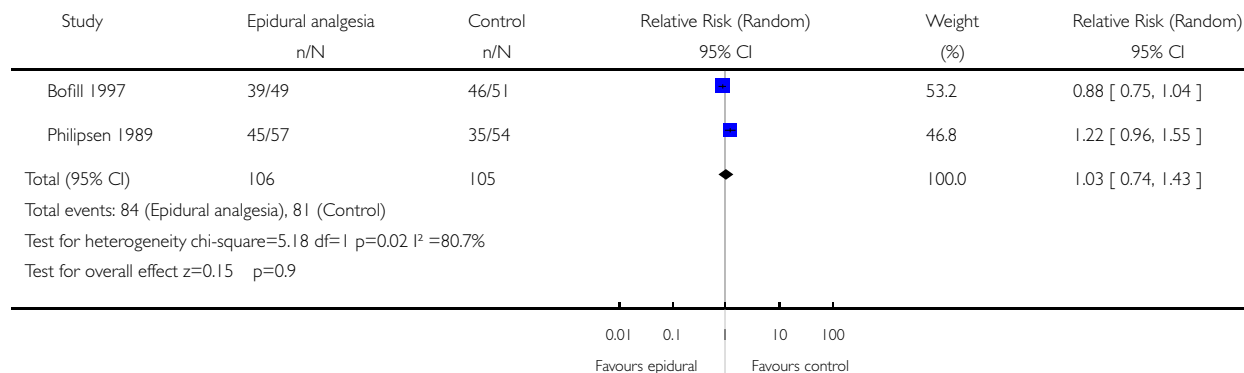
Analysis 01.37. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 37 Malposition

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 37 Malposition



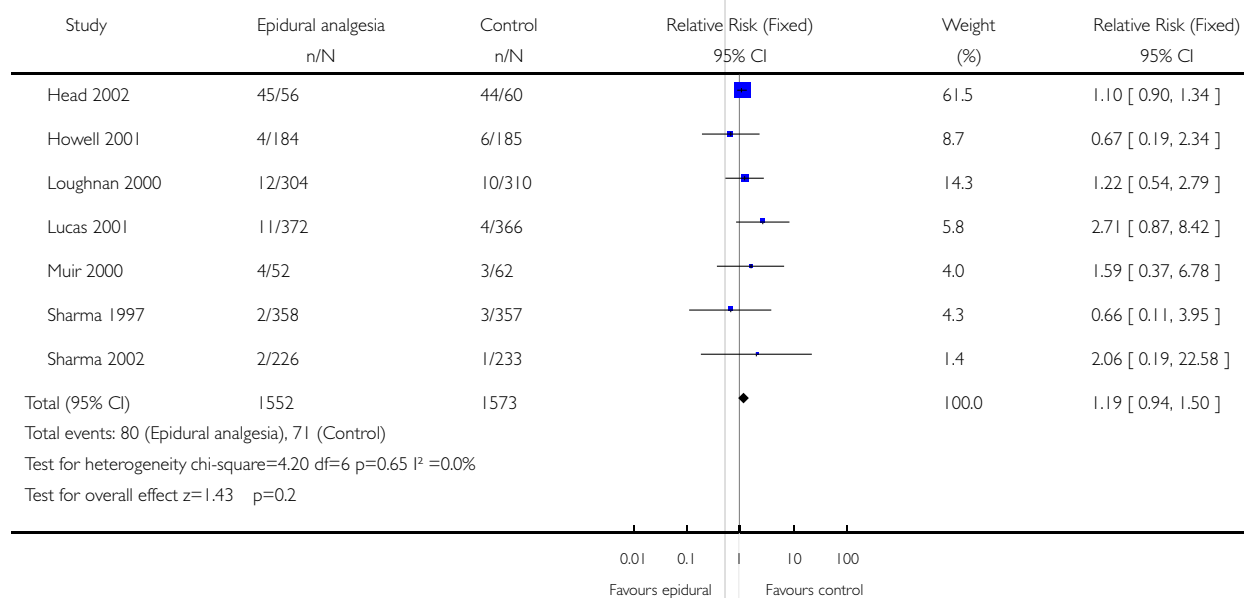
Analysis 01.38. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 38 Surgical amniotomy

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 38 Surgical amniotomy



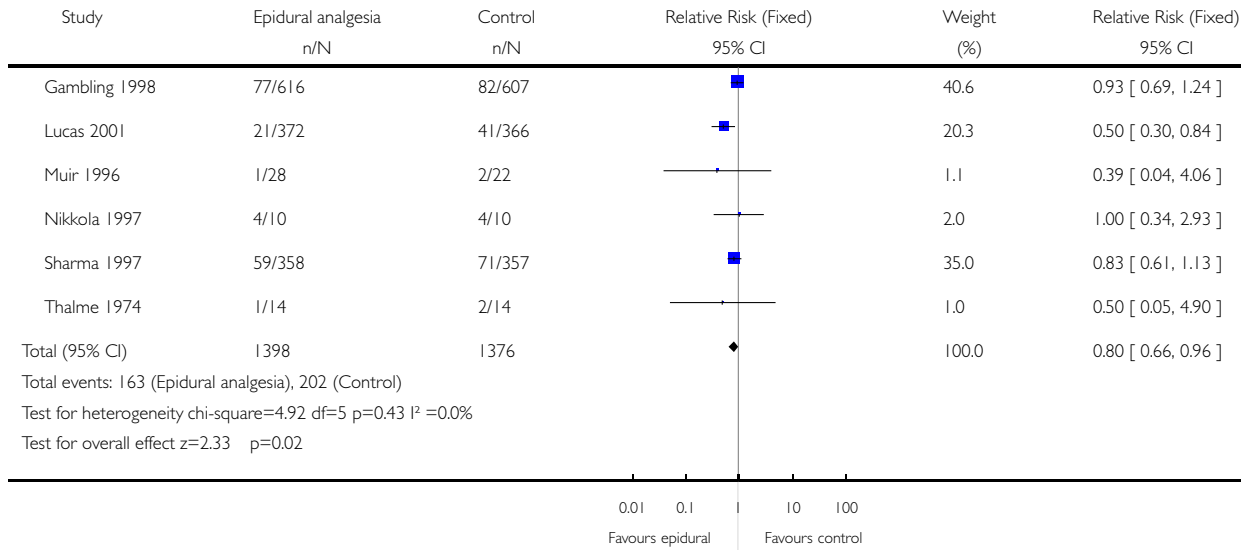
Analysis 01.39. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 39 Neonatal intensive care unit admission

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 39 Neonatal intensive care unit admission



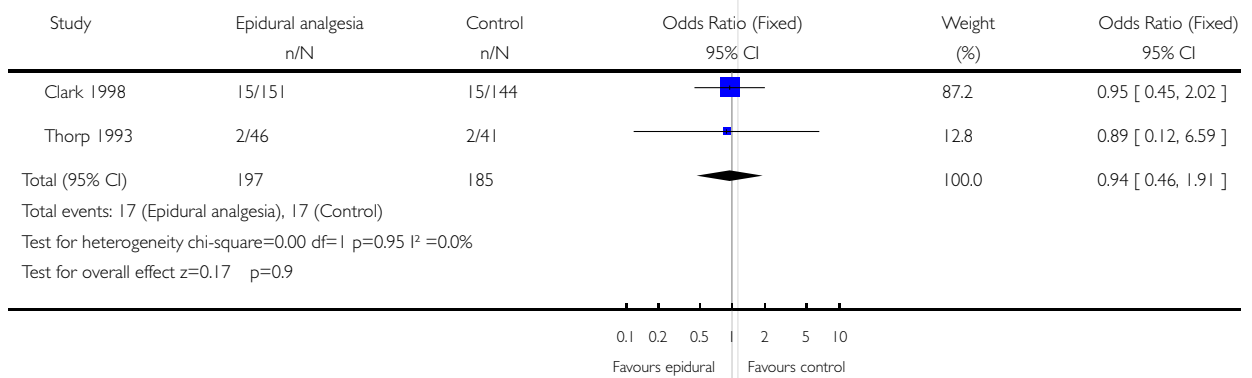
Analysis 01.40. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 40 Umbilical artery pH < 7.2 at delivery

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 40 Umbilical artery pH < 7.2 at delivery



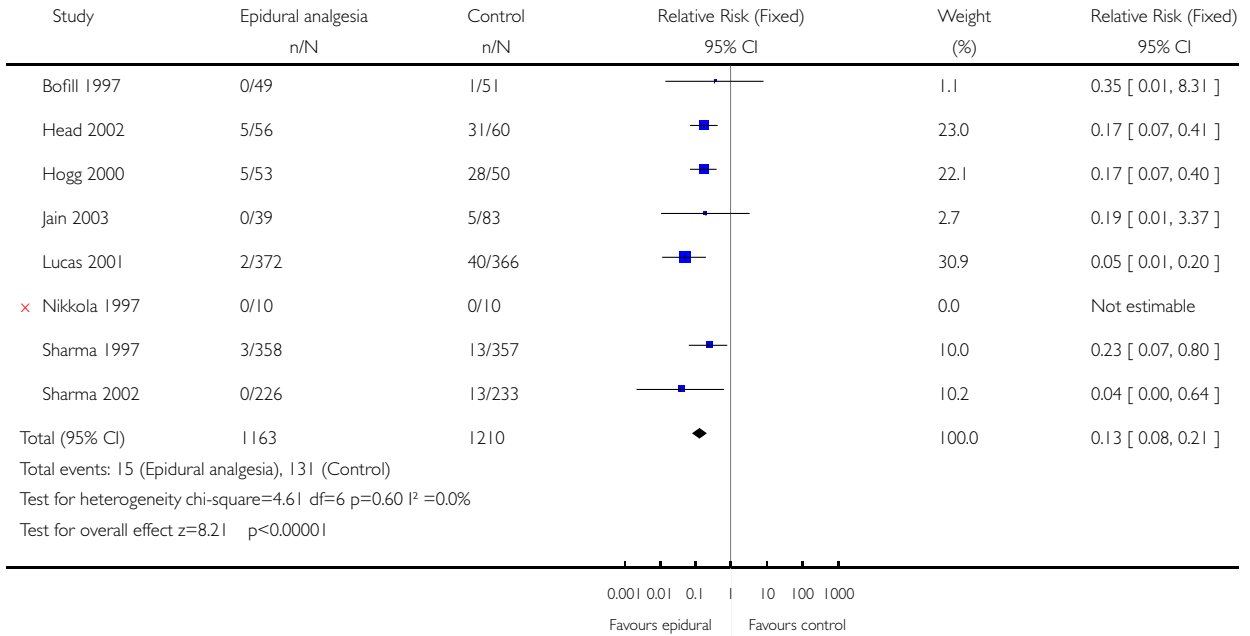
Analysis 01.41. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 41 Acidosis defined by cord arterial pH < 7.15

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 41 Acidosis defined by cord arterial pH < 7.15



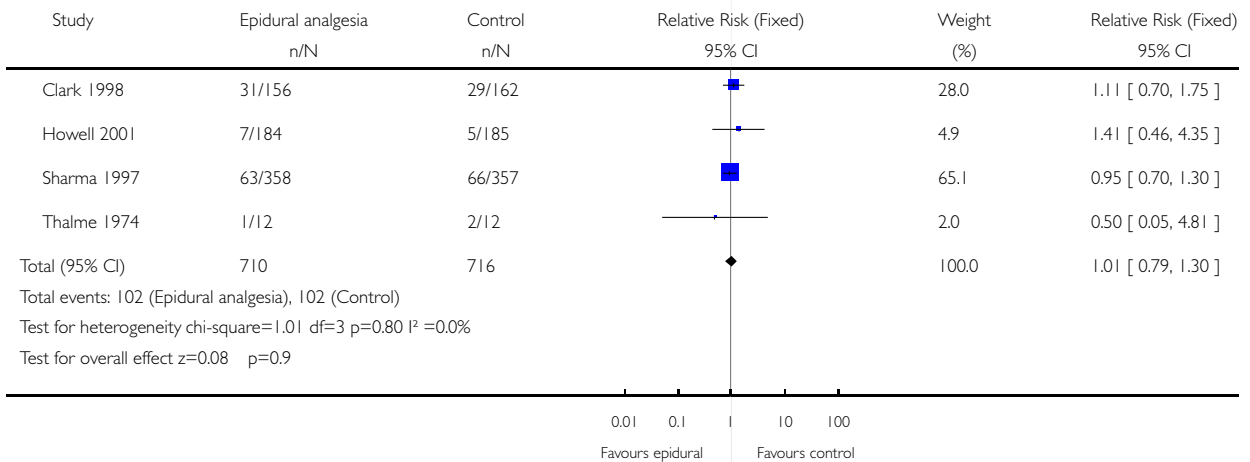
Analysis 01.42. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 42 Naloxone administration

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 42 Naloxone administration



Analysis 01.46. Comparison 01 Epidural versus non-epidural analgesia in labour, Outcome 46 Meconium staining of liquor

Review: Epidural versus non-epidural or no analgesia in labour
 Comparison: 01 Epidural versus non-epidural analgesia in labour
 Outcome: 46 Meconium staining of liquor

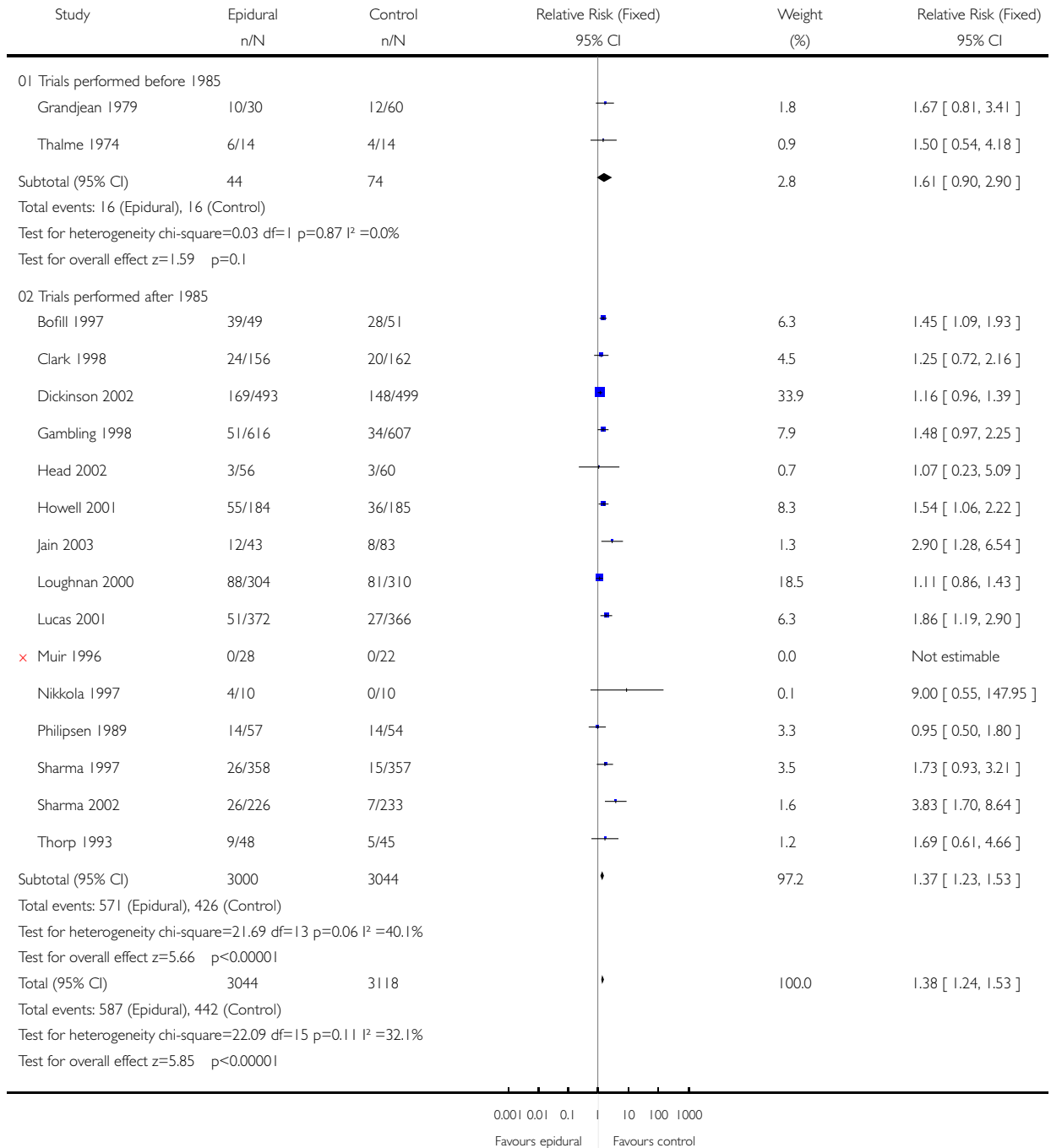


Analysis 02.01. Comparison 02 Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed, Outcome 01 Instrumental vaginal delivery

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 02 Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed

Outcome: 01 Instrumental vaginal delivery

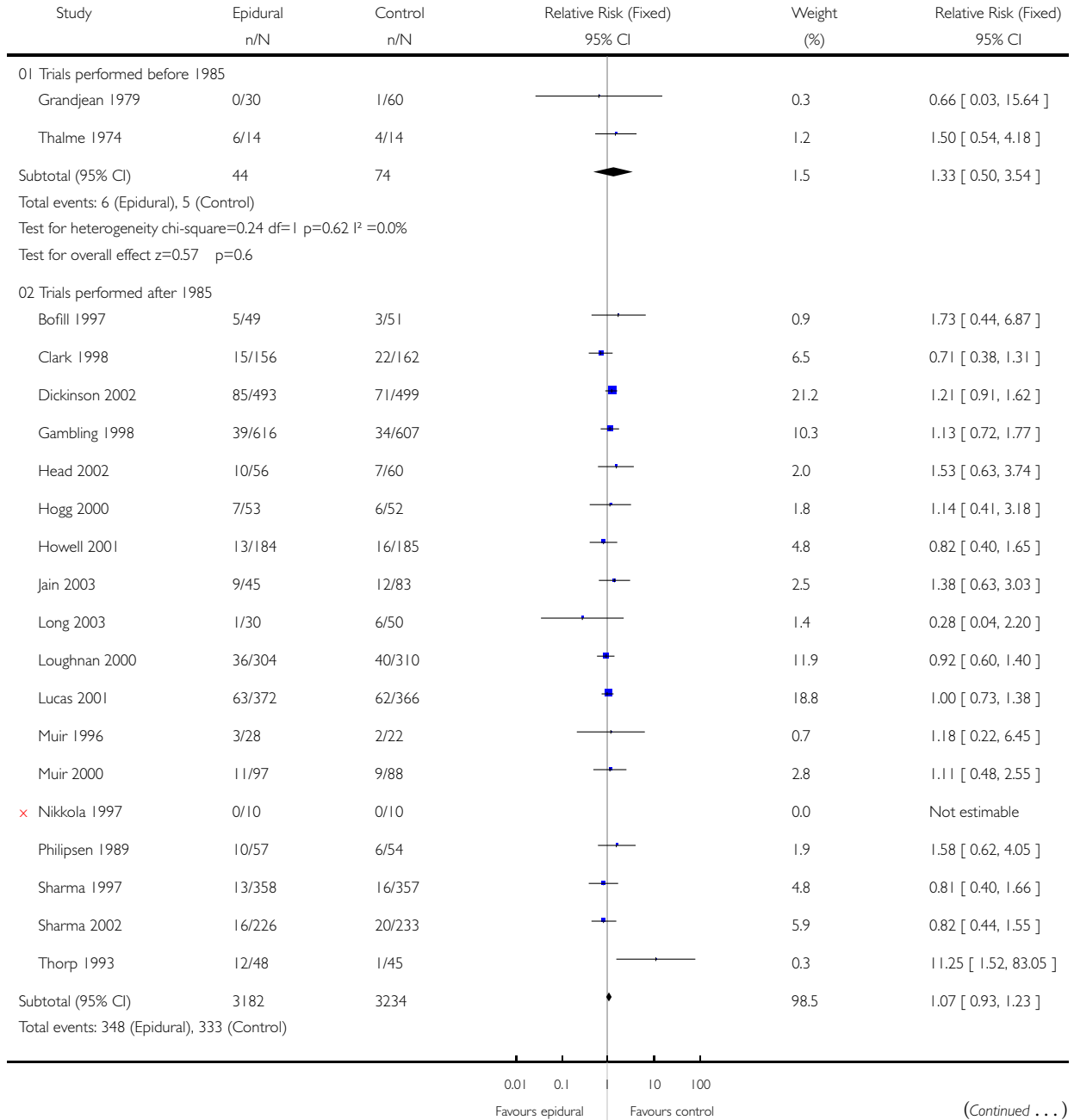


Analysis 02.02. Comparison 02 Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed, Outcome 02 Caesarean section)

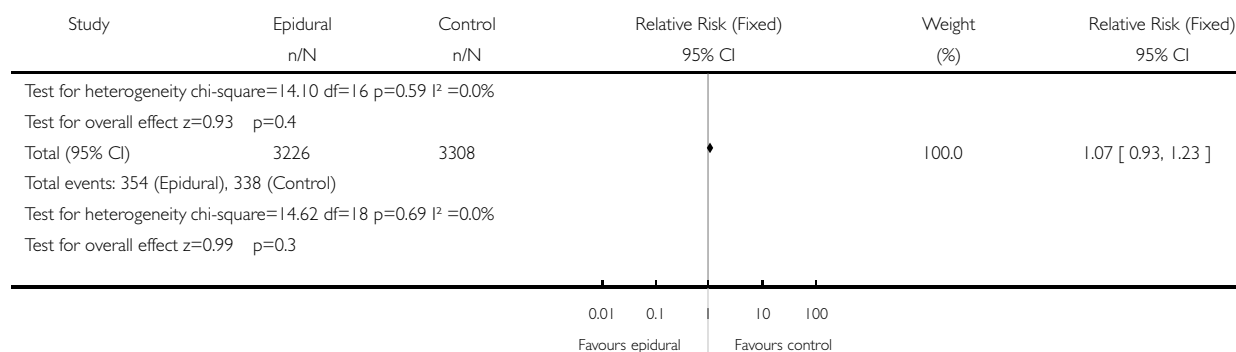
Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 02 Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed)

Outcome: 02 Caesarean section



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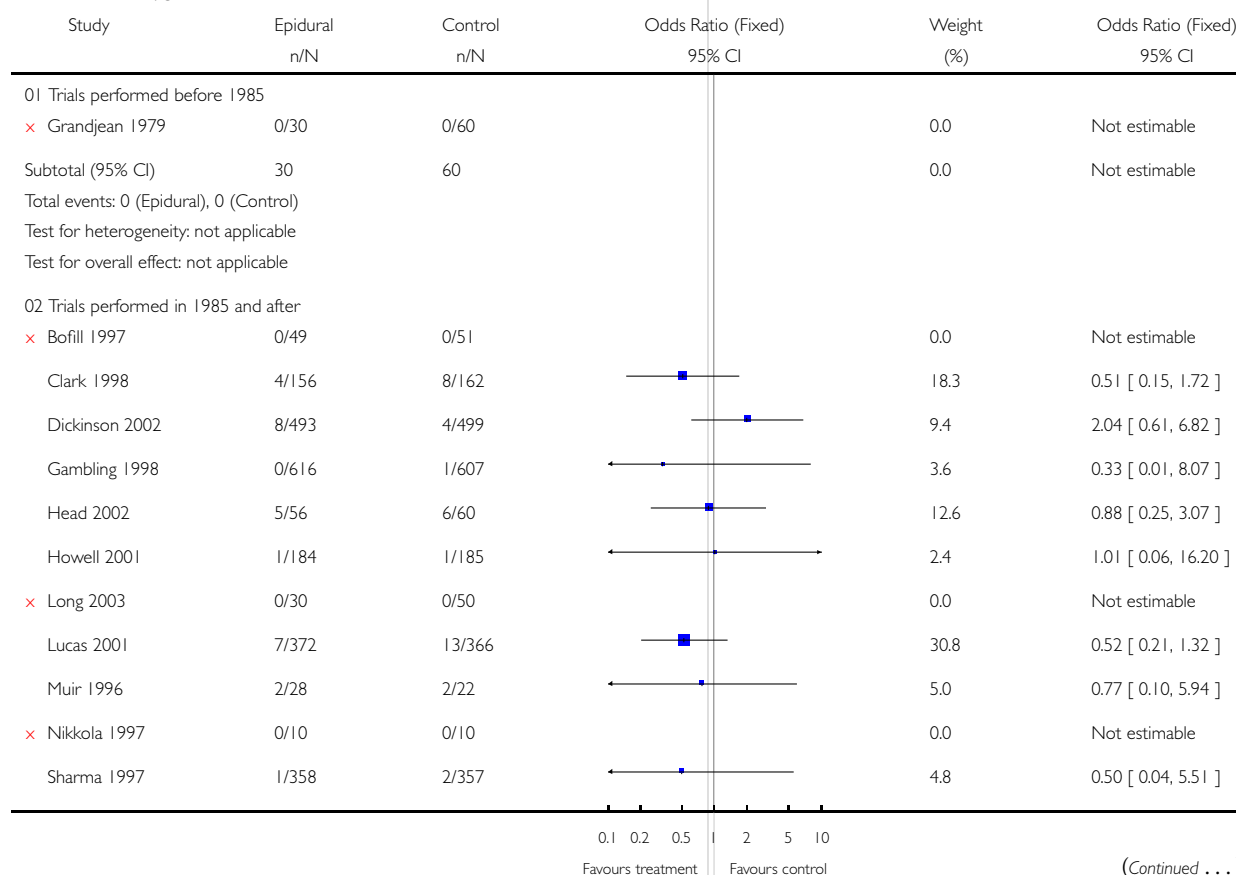


Analysis 02.03. Comparison 02 Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed, Outcome 03 Apgar score less than 7 at 5 minutes)

Review: Epidural versus non-epidural or no analgesia in labour

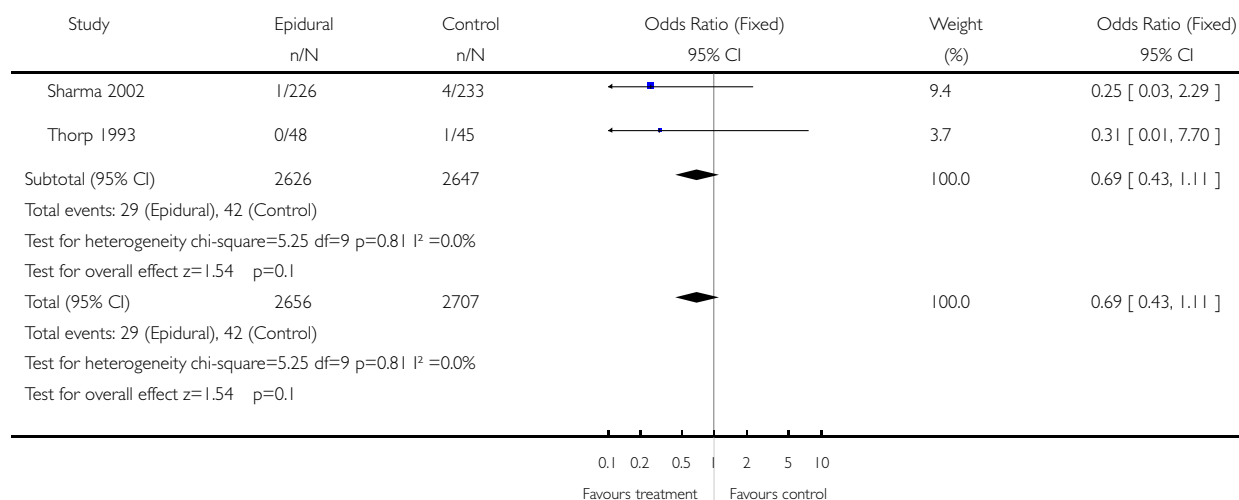
Comparison: 02 Epidural versus non-epidural analgesia for pain relief in labour (primary outcomes by year trial was performed)

Outcome: 03 Apgar score less than 7 at 5 minutes



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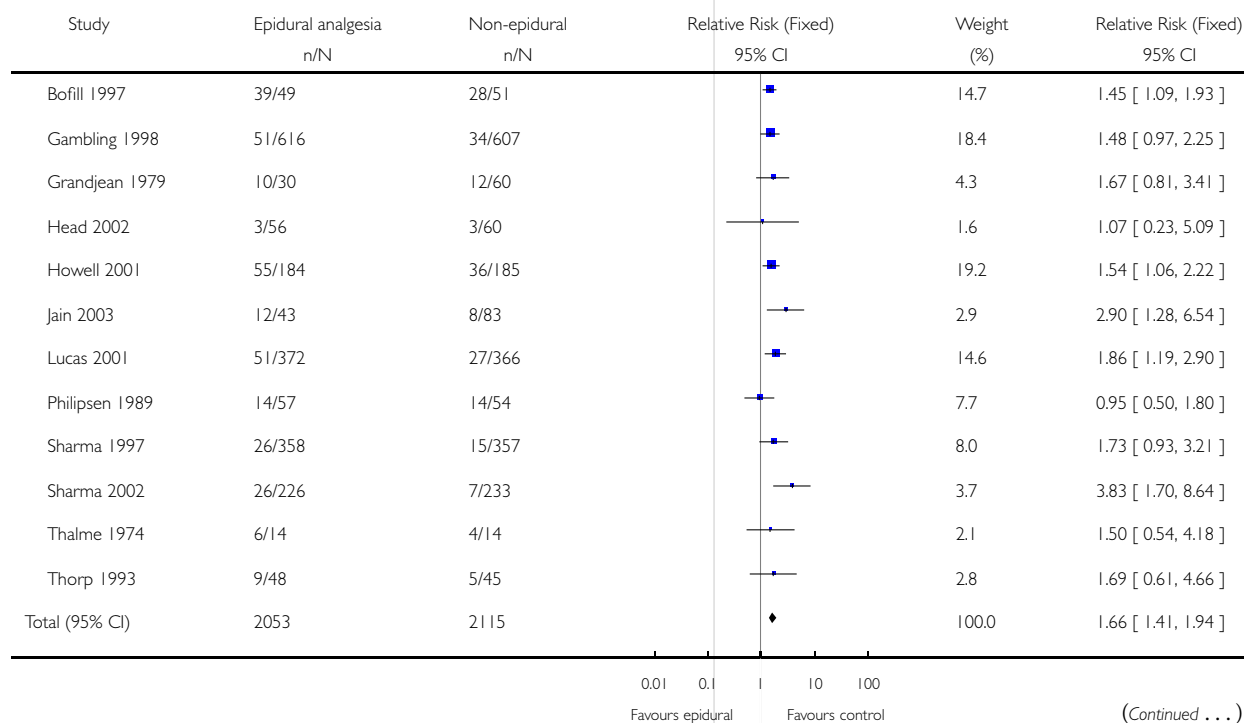


Analysis 03.01. Comparison 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation, Outcome 01 Instrumental delivery

Review: Epidural versus non-epidural or no analgesia in labour

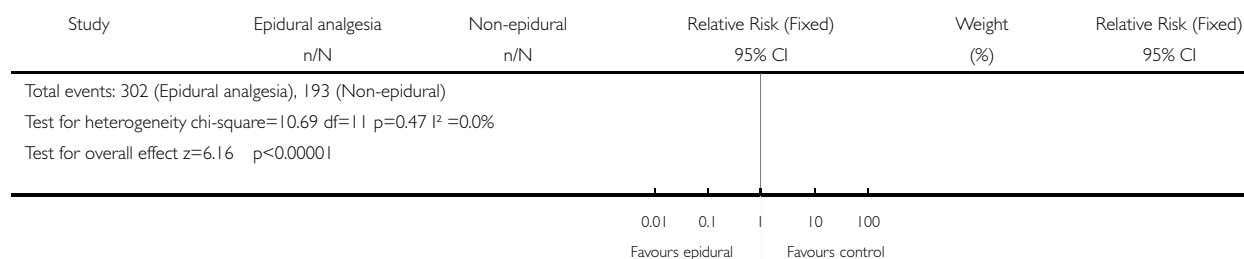
Comparison: 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation

Outcome: 01 Instrumental delivery



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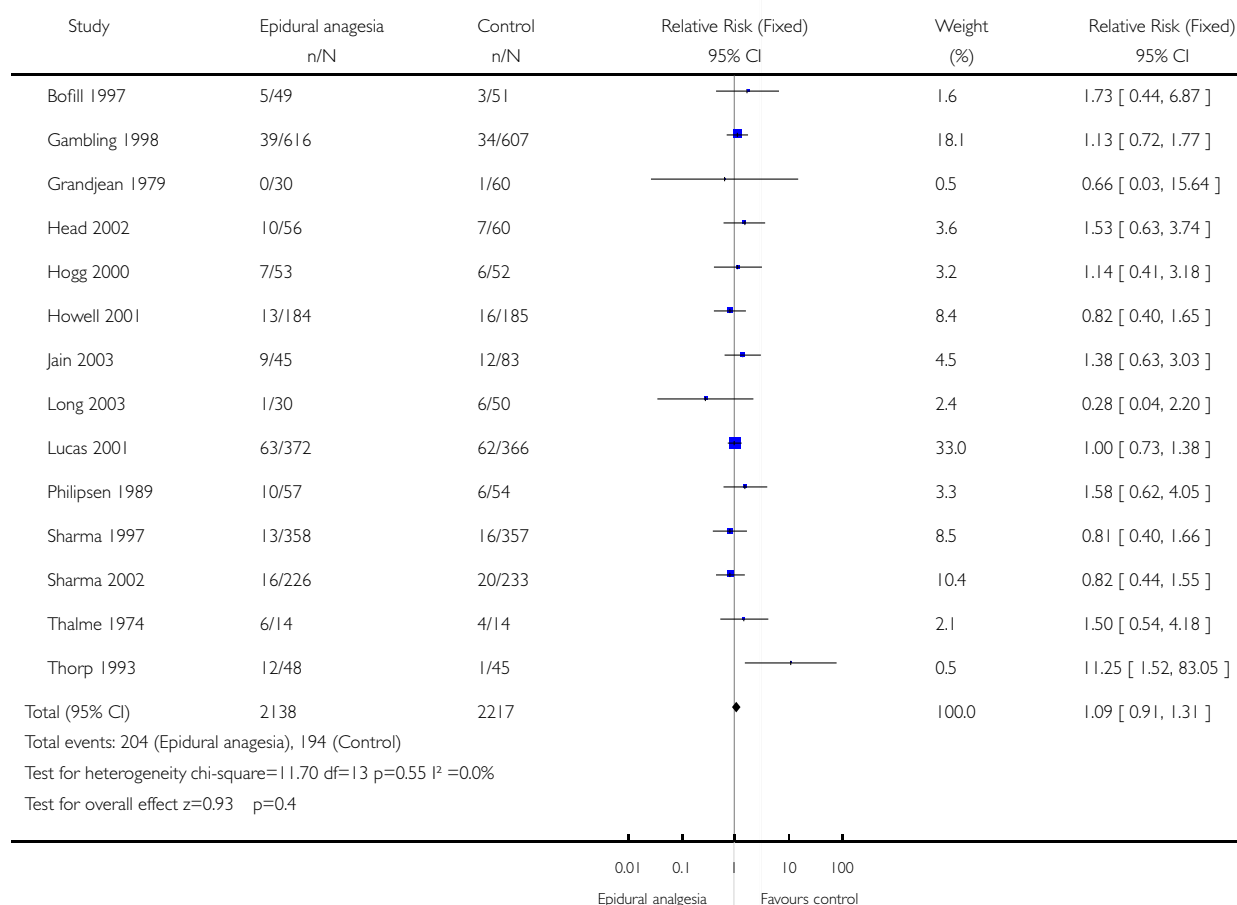


Analysis 03.02. Comparison 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation, Outcome 02 Caesarean section

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation

Outcome: 02 Caesarean section

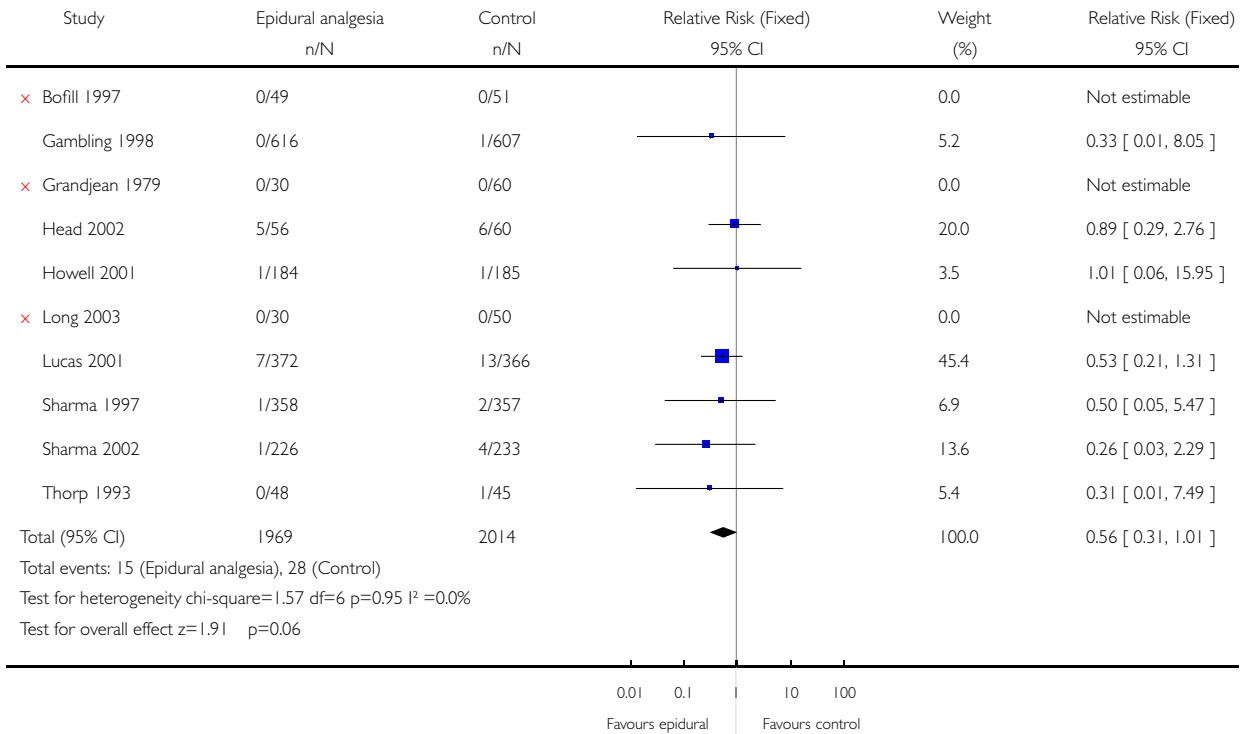


Analysis 03.03. Comparison 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation, Outcome 03 Apgar score less than 7 at 5 minutes

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation

Outcome: 03 Apgar score less than 7 at 5 minutes

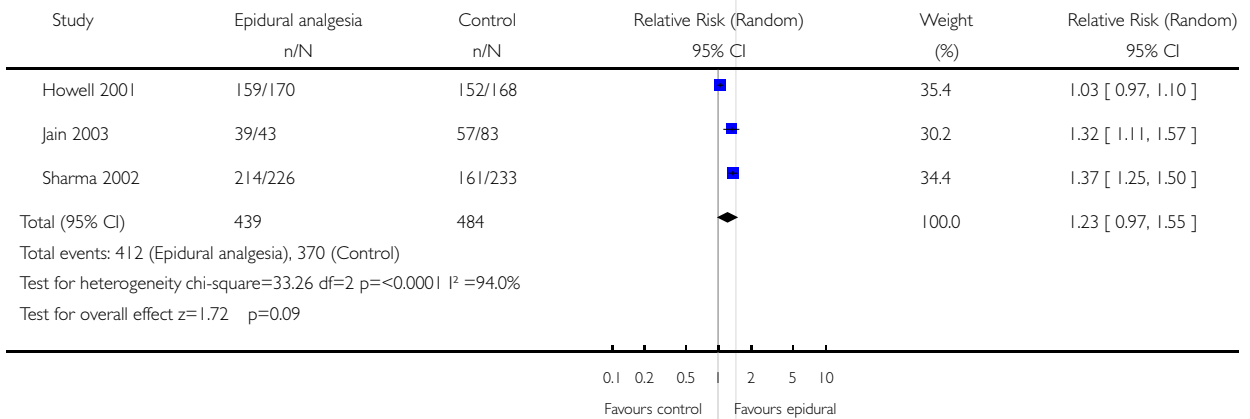


Analysis 03.04. Comparison 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation, Outcome 04 Maternal satisfaction with pain relief in labour

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation

Outcome: 04 Maternal satisfaction with pain relief in labour

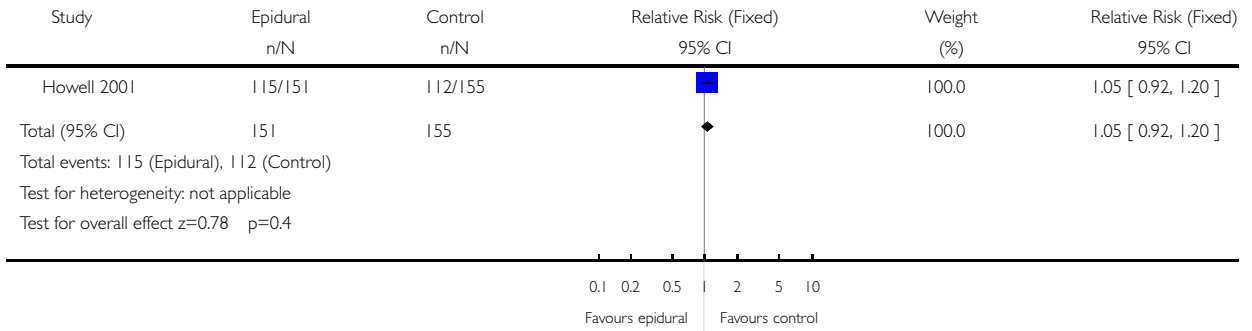


Analysis 03.05. Comparison 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation, Outcome 05 Long-term backache

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 03 Analysis of primary outcomes excluding trials where more than 30% of women did not receive their allocation

Outcome: 05 Long-term backache

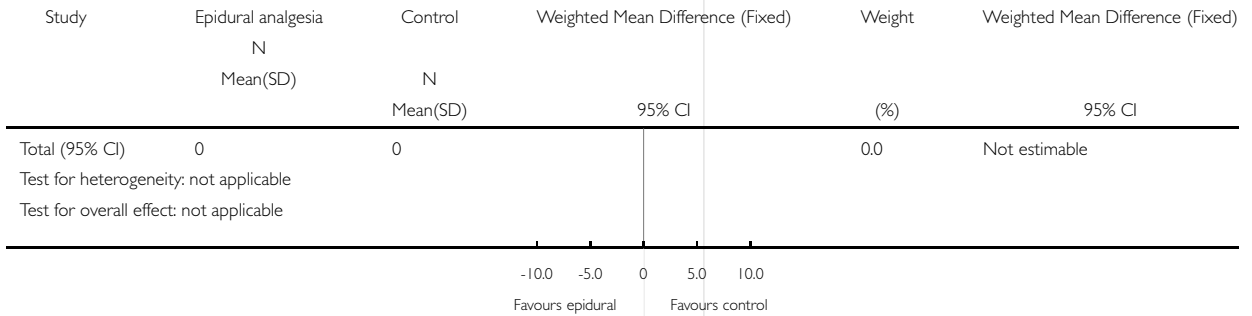


Analysis 04.01. Comparison 04 Sensitivity analysis of primary outcomes based on trial quality, Outcome 01 Woman's perception of pain relief in labour

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 04 Sensitivity analysis of primary outcomes based on trial quality

Outcome: 01 Woman's perception of pain relief in labour

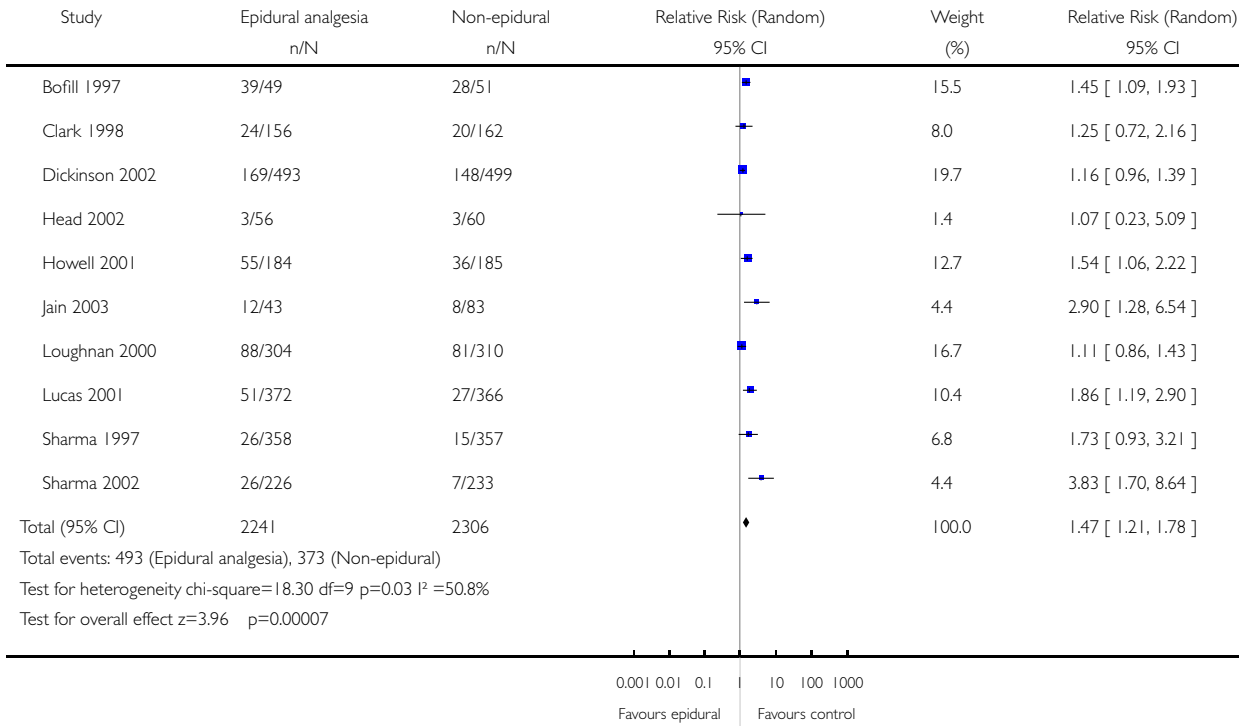


Analysis 04.02. Comparison 04 Sensitivity analysis of primary outcomes based on trial quality, Outcome 02 Instrumental delivery

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 04 Sensitivity analysis of primary outcomes based on trial quality

Outcome: 02 Instrumental delivery

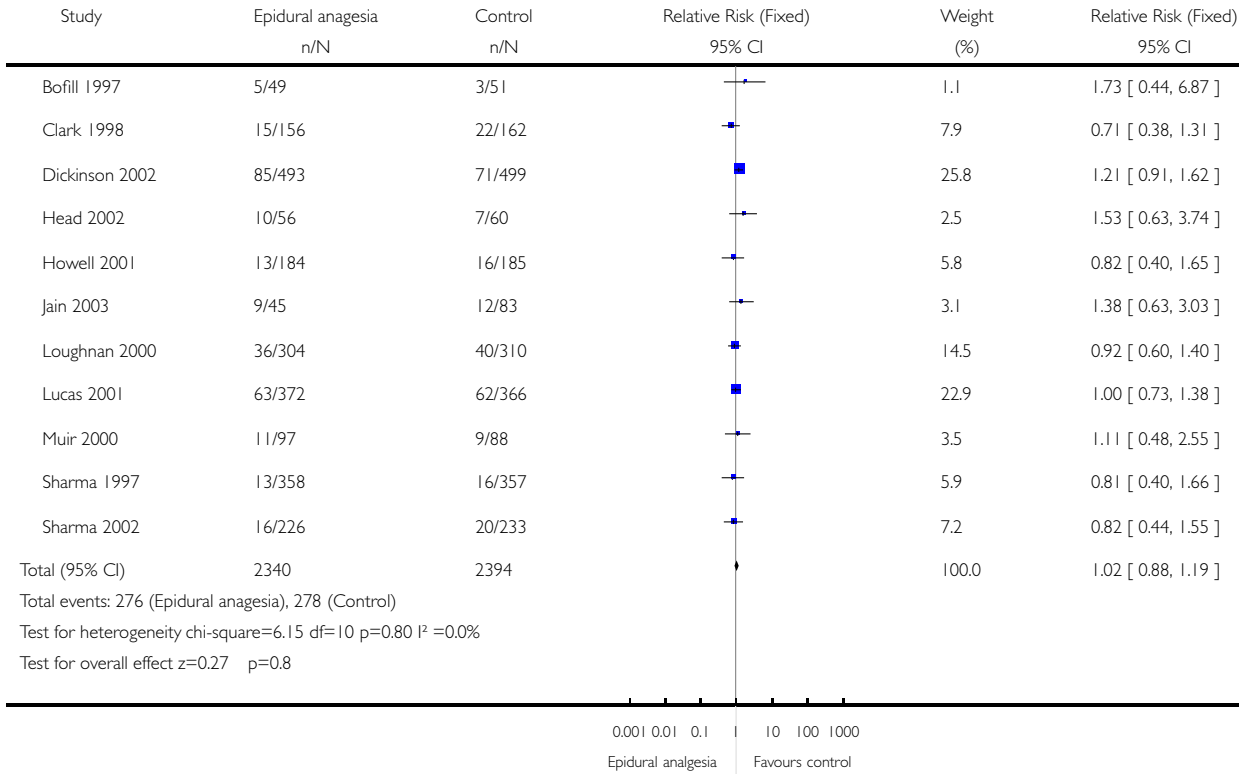


Analysis 04.03. Comparison 04 Sensitivity analysis of primary outcomes based on trial quality, Outcome 03 Caesarean section

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 04 Sensitivity analysis of primary outcomes based on trial quality

Outcome: 03 Caesarean section

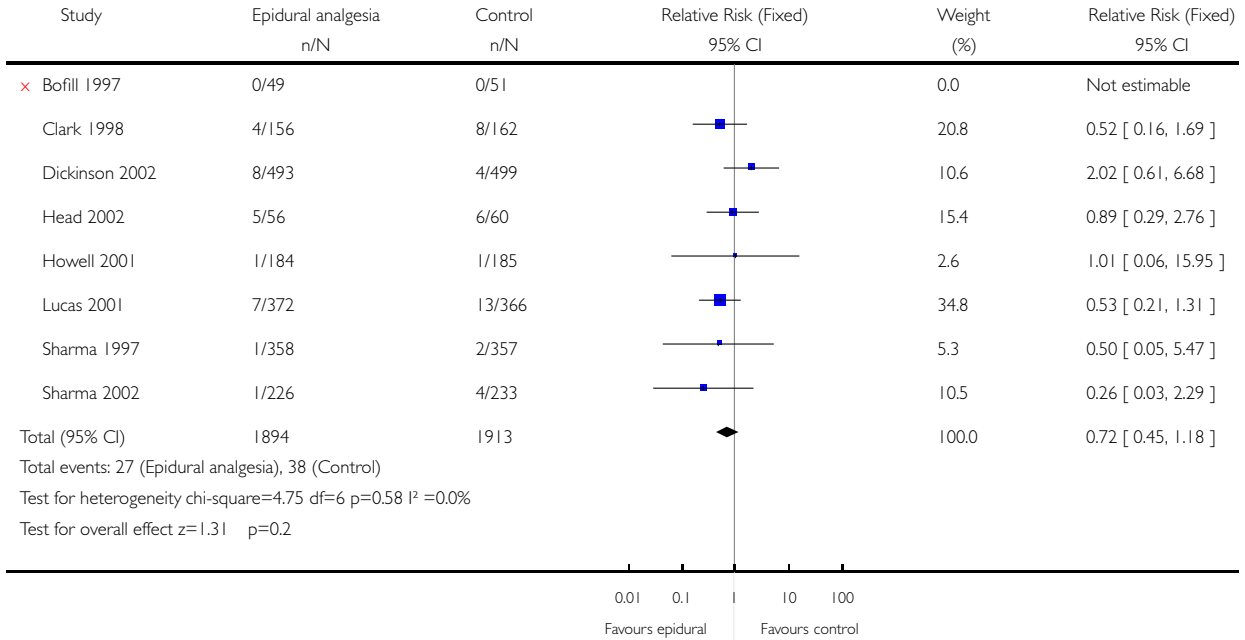


Analysis 04.04. Comparison 04 Sensitivity analysis of primary outcomes based on trial quality, Outcome 04 Apgar score less than 7 at 5 minutes

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 04 Sensitivity analysis of primary outcomes based on trial quality

Outcome: 04 Apgar score less than 7 at 5 minutes

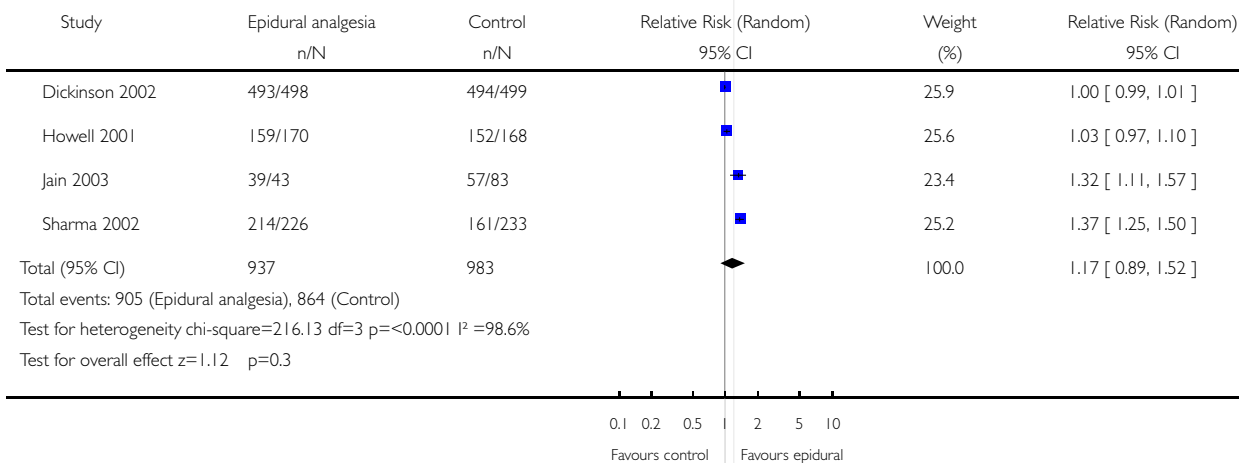


Analysis 04.05. Comparison 04 Sensitivity analysis of primary outcomes based on trial quality, Outcome 05 Women satisfied with pain relief

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 04 Sensitivity analysis of primary outcomes based on trial quality

Outcome: 05 Women satisfied with pain relief

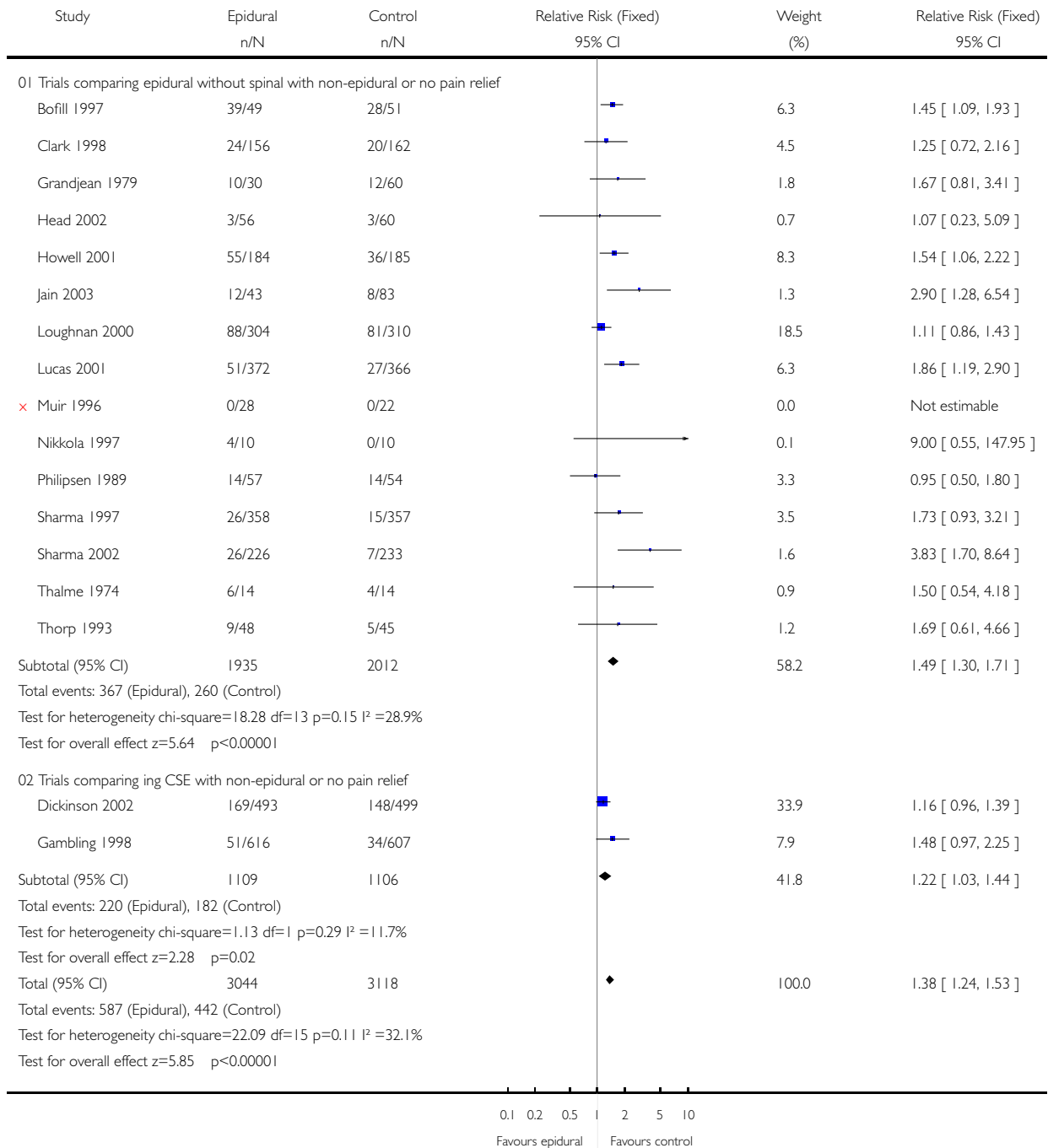


Analysis 05.01. Comparison 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE), Outcome 01 Instrumental delivery

Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE)

Outcome: 01 Instrumental delivery

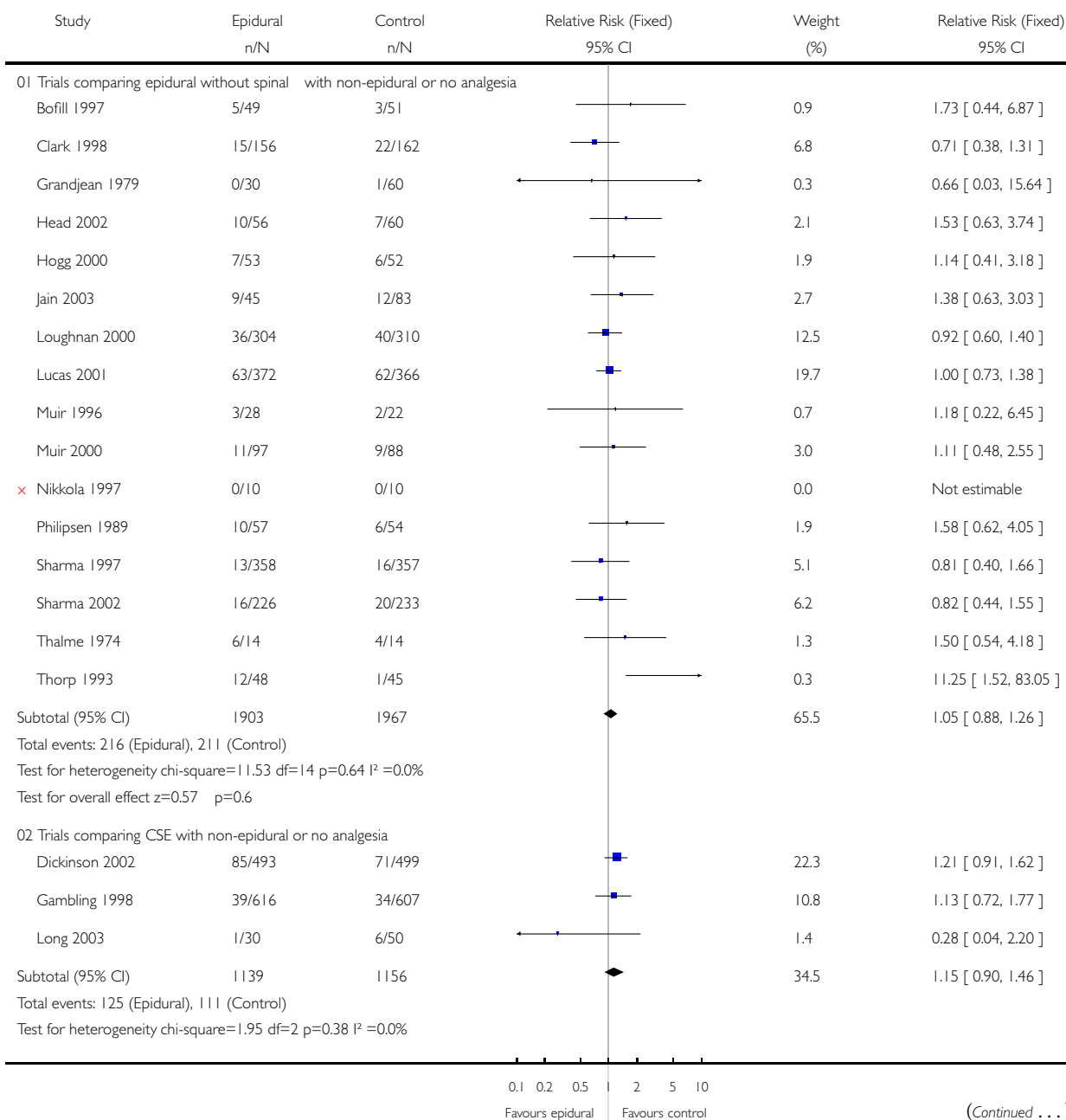


Analysis 05.02. Comparison 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE), Outcome 02 Caesarean section

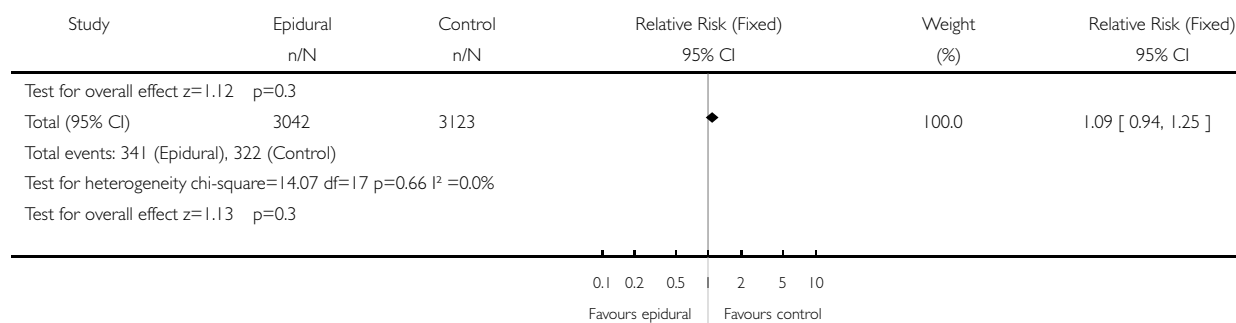
Review: Epidural versus non-epidural or no analgesia in labour

Comparison: 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE)

Outcome: 02 Caesarean section



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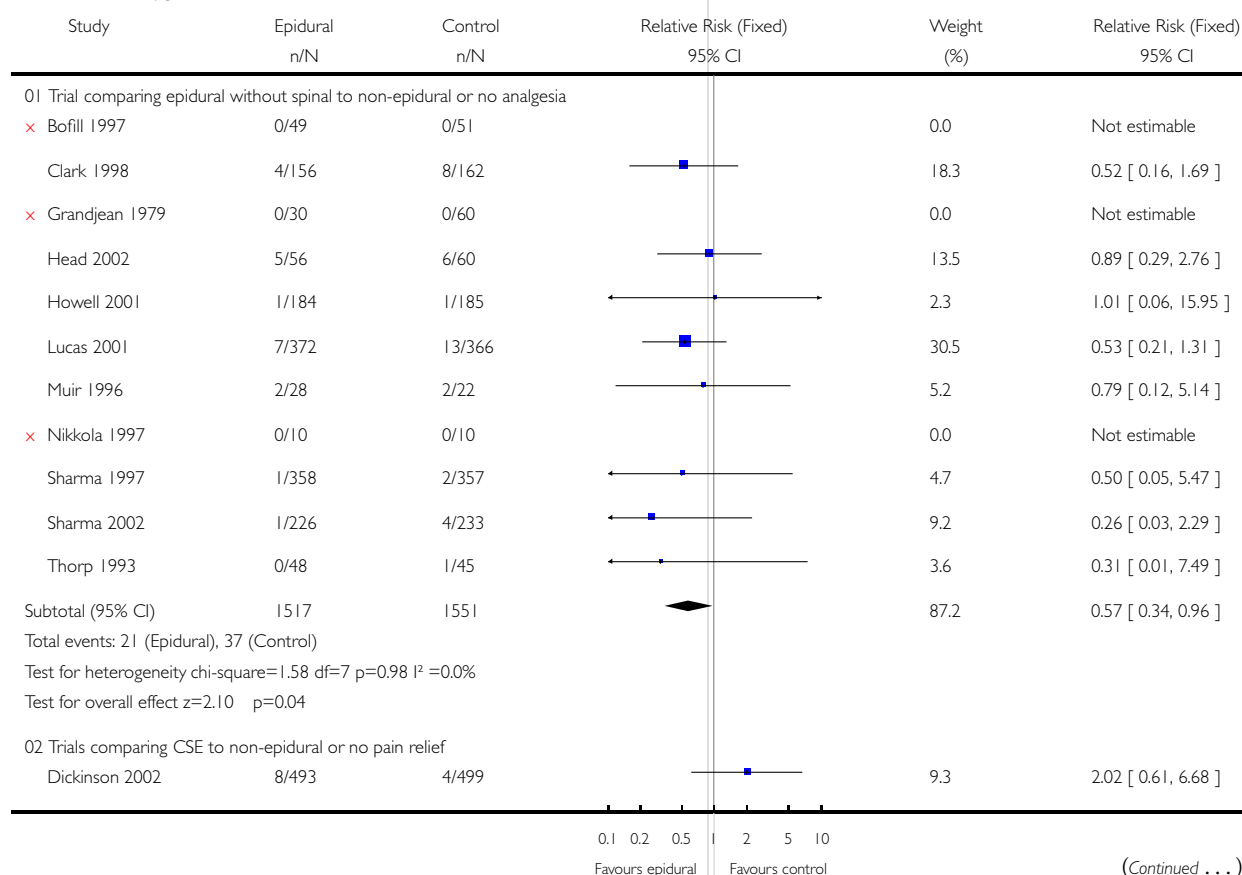


Analysis 05.03. Comparison 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE), Outcome 03 Apgar score less than 7 at 5 minutes

Review: Epidural versus non-epidural or no analgesia in labour

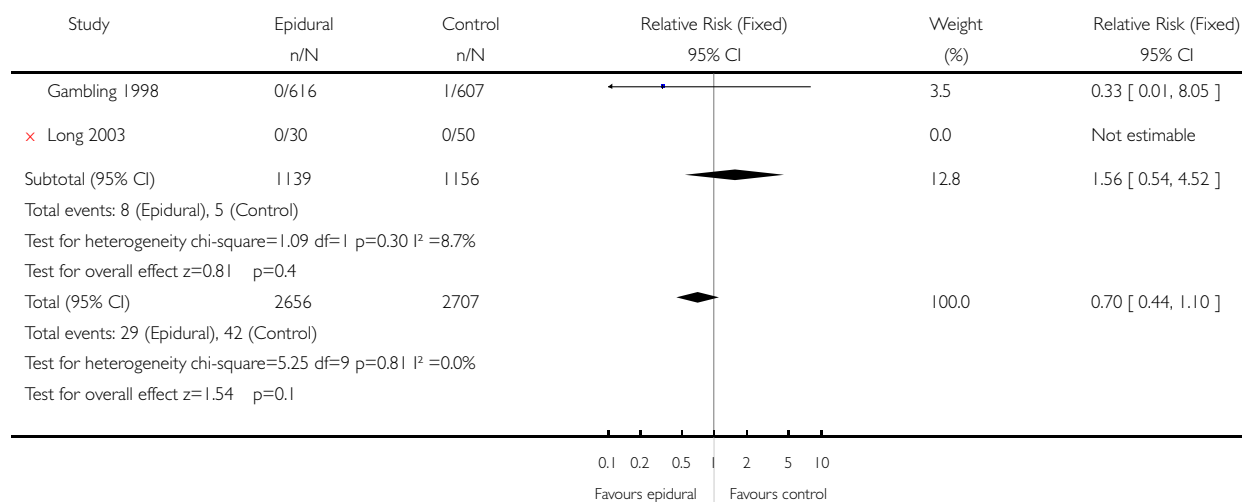
Comparison: 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE)

Outcome: 03 Apgar score less than 7 at 5 minutes



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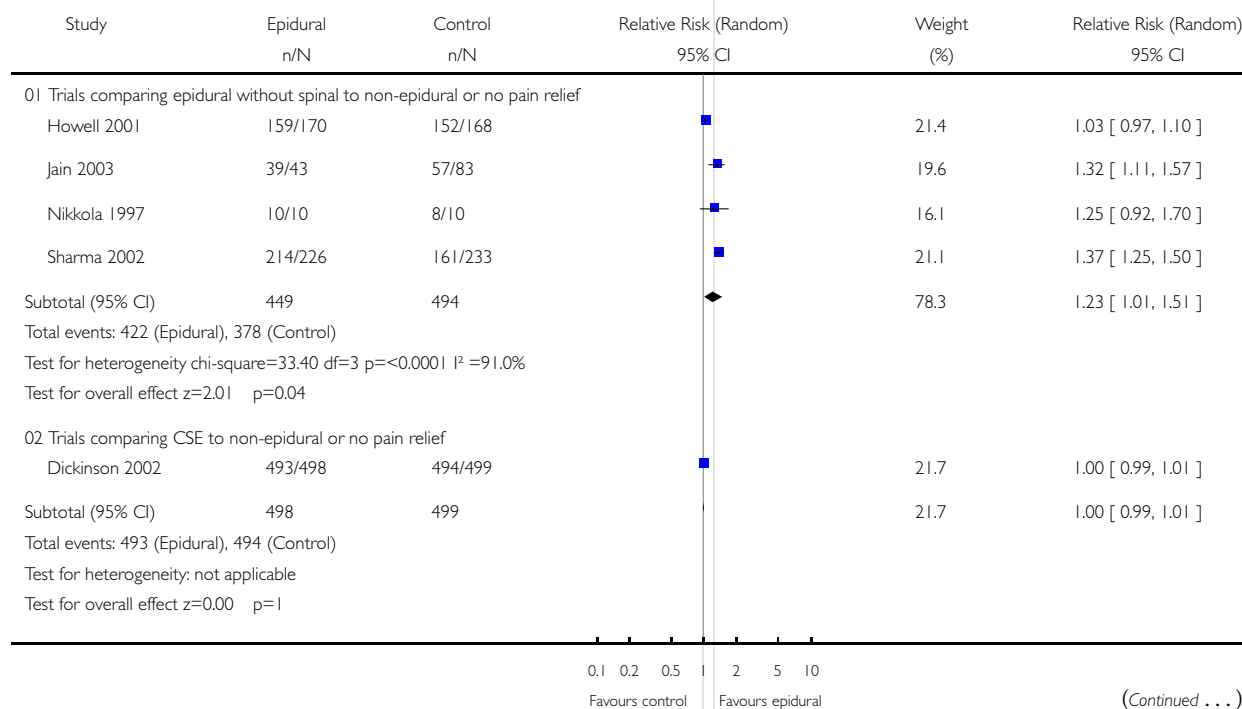


Analysis 05.04. Comparison 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE), Outcome 04 Women satisfied with their pain relief

Review: Epidural versus non-epidural or no analgesia in labour


Comparison: 05 Subgroup analysis based on epidural technique (epidural without spinal compared to CSE)

Outcome: 04 Women satisfied with their pain relief



(Continued ...)

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| Study | Epidural n/N | Control n/N | Relative Risk (Random) | | Weight (%) | Relative Risk (Random) | |
|---|-----------------|----------------|---|--|---------------|------------------------|--|
| | | | 95% CI | | | 95% CI | |
| Total (95% CI) | 947 | 993 |  | | 100.0 | 1.18 [0.92, 1.50] | |
| Total events: 915 (Epidural), 872 (Control) | | | | | | | |
| Test for heterogeneity chi-square=222.54 df=4 p=<0.0001 I ² =98.2% | | | | | | | |
| Test for overall effect z=1.31 p=0.2 | | | | | | | |

0.1 0.2 0.5 | 2 5 10
Favours control Favours epidural