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Expectant care versus surgical treatment for miscarriage

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ABSTRACT

Background

Miscarriage is a common complication of early pregnancy that can have both medical and psychological consequences such as depression and anxiety. The need for routine surgical evacuation with miscarriage has been questioned because of potential complications such as cervical trauma, uterine perforation, hemorrhage, or infection.

Objectives

To compare the safety and effectiveness of expectant management versus surgical treatment for early pregnancy failure.

Search methods

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (9 February 2012), the Cochrane Central Register of Controlled Trials (*The Cochrane Library* 2011, Issue 4 of 4), PubMed (2005 to 11 January 2012), POPLINE (inception to 11 January 2012), LILACS (2005 to 11 January 2012) and reference lists of retrieved studies.

Selection criteria

Randomized trials comparing expectant care and surgical treatment (vacuum aspiration or dilation and curettage) for miscarriage were eligible for inclusion.

Data collection and analysis

Two review authors assessed trial quality and extracted data. We contacted study authors for additional information. For dichotomous data, we calculated the Mantel-Haenszel risk ratio (RR) with 95% confidence interval (CI). For continuous data, we computed the mean difference (MD) and 95% CI. We entered additional data such as medians into 'Other data' tables.

Main results

We included seven trials with 1521 participants in this review. The expectant-care group was more likely to have an incomplete miscarriage by two weeks (RR 3.98; 95% CI 2.94 to 5.38) or by six to eight weeks (RR 2.56; 95% CI 1.15 to 5.69). The need for unplanned surgical treatment was greater for the expectant-care group (RR 7.35; 95% CI 5.04 to 10.72). The mean percentage needing surgical management in the expectant-care group was 28%, while 4% of the surgical-treatment group needed additional surgery. The

expectant-care group had more days of bleeding (MD 1.59; 95% CI 0.74 to 2.45). Further, more of the expectant-care group needed transfusion (RR 6.45; 95% CI 1.21 to 34.42). The mean percentage needing blood transfusion was 1.4% for expectant care compared with none for surgical management. Results were mixed for pain. Diagnosis of infection was similar for the two groups (RR 0.63; 95% CI 0.36 to 1.12), as were results for various psychological outcomes. Pregnancy data were limited. Costs were lower for the expectant-care group (MD -499.10; 95% CI -613.04 to -385.16; in UK pounds sterling).

Authors' conclusions

Expectant management led to a higher risk of incomplete miscarriage, need for unplanned (or additional) surgical emptying of the uterus, bleeding and need for transfusion. Risk of infection and psychological outcomes were similar for both groups. Costs were lower for expectant management. Given the lack of clear superiority of either approach, the woman's preference should be important in decision making. Pharmacological ('medical') management has added choices for women and their clinicians and has been examined in other reviews.

PLAIN LANGUAGE SUMMARY

Expectant care (waiting) versus surgical treatment for miscarriage

Miscarriage is pregnancy failure before 14 weeks, which is common in early pregnancy. Such a loss in early pregnancy can affect a woman's physical and mental health. Doctors often suggest surgery such as dilation and curettage (D and C) or vacuum aspiration to complete the process. Surgery might cause problems such as trauma, heavy bleeding, or infection. Expectant management means waiting for the miscarriage to finish on its own, and may involve bed rest, examination by ultrasound, and antibiotics. This review looked at whether expectant management works as well as surgery for miscarriage.

We searched for randomized trials that compared waiting versus surgery for miscarriage. In addition, we looked at reference lists to find trials. We also wrote to researchers to find more studies. Seven trials with 1521 women looked at waiting versus surgery for miscarriage. More women who waited for the miscarriage to complete on its own had tissue left in the womb. This was studied at two weeks and at six to eight weeks. More of these women needed surgery to complete the process. These women also had more days of bleeding. Some needed to be given blood, compared with none in the surgery group. Both groups had about the same numbers of infections. Results were mixed for pain. Mental health also seemed about the same for both treatment groups. Costs were lower for waiting than for surgery. Overall, no strong medical results argue for either approach. Information was limited on future pregnancy. One trial was large, while the others had small numbers of women. What the woman prefers should be the major concern. Drug treatment (such as with misoprostol and mifepristone) has added choices for women and their clinicians, and has been studied in other reviews.

BACKGROUND

Miscarriage is a common outcome of pregnancy (15% to 20%) ([Hemminki 1998](#)), which can have both medical and psychological consequences. Medical complications include infection, hemorrhage, embolism, and complications of anesthesia ([Saraiya 1999](#)). Psychological consequences include depression and anxiety, for both the woman and her partner ([Conway 2000](#); [Geller 2001](#); [Neugebauer 1997](#)).

The terminology of miscarriage has been confusing to providers and to women. Terms used for describing the underlying pathologic abnormality include anembryonic pregnancy (trophoblast development without development of an embryo); embryonic

death (an embryo greater than 5 mm, up to eight-week size, with no cardiac activity on ultrasound examination); and fetal death (death after eight weeks). The terms used to describe the process of miscarriage are incomplete miscarriage (passage of some pregnancy-related tissue, along with clinical or ultrasonic evidence of retained tissue) and inevitable miscarriage (bleeding without passage of tissue but with an open cervix). Common terms for miscarriage, such as 'missed abortion' and 'blighted ovum', do not reflect current understanding of early pregnancy physiology ([Chen 2007](#)). 'Missed abortion' refers to a pregnancy that is retained for a prolonged time after its death. 'Blighted ovum' is another inaccurate and outdated term that implies failure or absence of an embryo at a very early stage of pregnancy. The preferred term today

is 'early pregnancy failure' (Chen 2007; Dalton 2009).

Historically, physicians believed that all miscarriages should be considered incomplete, and that the potential complications of retained placental tissue justified surgical evacuation in all cases. When surgical intervention is needed, suction curettage is superior to sharp curettage with a rigid metal curette (WHO 2003). Sharp curettage is obsolete and should have little use in gynecology. Although suction curettage (vacuum aspiration or manual vacuum aspiration) has replaced sharp curettage in developed countries, it is less common in developing countries due to lack of experience and equipment. In countries where abortion is illegal, or where women have limited access to abortion, the management of miscarriage is complicated by ambiguity regarding whether the miscarriage was truly spontaneous or illegally induced. Surgical treatment has also been the standard management for pregnancies that are found to be non-viable on early ultrasound.

The natural course of early pregnancy failure is unknown, however, and the need for routine surgical evacuation has been questioned (Ballagh 1998). Surgical evacuation may lead to cervical trauma, uterine perforation, or intrauterine adhesions. Postoperative endometritis is another potential complication. Pelvic ultrasound examination has been suggested as a way to determine the presence or absence of retained tissue and need for further intervention. Medical management of miscarriage with agents such as misoprostol or the progesterone antagonist mifepristone has also been proposed as an alternative to surgical treatment (Chen 2007). The literature on expectant management is sparse and features a wide range of success rates. Moreover, data on the acceptability of different management strategies are limited (Sotiriadis 2005).

Some clinicians recommend surgical intervention to avoid the uncertainty regarding passage of tissue with expectant management, since the woman may be upset during the wait (Sharma 1993). In a survey of women attending a family planning clinic, respondents were asked about their preferred therapy if they were to experience a miscarriage in the future. Most indicated a strong preference for expectant treatment, but the physician's recommendation would clearly influence their decision (Molnar 2000). In Michigan (USA), most women with early pregnancy failure are managed with either suction curettage or expectant management (Dalton 2009).

OBJECTIVES

To compare the effectiveness and safety of expectant management versus surgical treatment for early pregnancy failure.

METHODS

Criteria for considering studies for this review

Types of studies

All published, unpublished, and ongoing randomized trials with available data that compared outcomes between women treated surgically and women managed expectantly for miscarriage as defined above. Trials must have included random allocation to treatment and comparison groups.

Types of participants

Women with miscarriage (spontaneous pregnancy loss at less than 14 weeks gestation), with either ultrasound evidence of retained tissue, or with a clinical diagnosis of inevitable miscarriage or incomplete miscarriage (where there could be uncertainty as to whether any tissue remains in the uterus). In addition, we included women with ultrasound evidence of non-viable pregnancies at less than 14 weeks gestation.

Types of interventions

Expectant management excluded any surgical or medical (drug) treatment for miscarriage, but allowed bedrest, ultrasound examination, and antibiotics. Expectant management was compared with any type of surgical treatment, such as manual vacuum aspiration, suction curettage, and sharp curettage (with or without dilation). Surgical treatment could have been with or without bedrest, ultrasound examination, or antibiotics.

Exclusion criteria

1. Studies comparing different methods of induced abortion.
2. Studies comparing different medical treatments for miscarriage.
3. Studies comparing expectant care versus medical treatment for miscarriage.
4. Studies comparing surgery versus medical treatment for miscarriage.
5. Studies comparing different surgical methods for miscarriage.

Types of outcome measures

Primary outcomes

1. Incomplete miscarriage (based on clinical findings of retained tissue at operation or ultrasound examination after a specific time period).
2. Need for unplanned (or additional) surgical evacuation (such as vacuum aspiration).

3. Complications, such as uterine perforation, complication requiring hysterectomy, need for admission to intensive care unit, or severe sepsis (associated organ dysfunction, hypoperfusion abnormality, or sepsis-induced hypotension).

4. Localized pelvic infection.
5. Need for blood transfusion.
6. Death.

Secondary outcomes

1. Days of bleeding.
2. Discomfort or pain.
3. Psychological outcomes (women's preferences or satisfaction with therapy, as well as depression and anxiety).
4. Costs (all reported direct and indirect costs from all reported perspectives).
5. Intrauterine adhesions.
6. Subsequent fertility (since all women do not attempt pregnancy, the denominator of this outcome was limited).

Search methods for identification of studies

Electronic searches

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register by contacting the Trials Search Coordinator (9 February 2012).

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

1. quarterly searches of the Cochrane Central Register of Controlled Trials (CENTRAL);
2. weekly searches of MEDLINE;
3. weekly searches of EMBASE;
4. handsearches of 30 journals and the proceedings of major conferences;
5. weekly current awareness alerts for a further 44 journals plus monthly BioMed Central email alerts.

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

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

In addition, we searched the Cochrane Central Register of Controlled Trials (*The Cochrane Library* 2011, Issue 4 of 4), PubMed (1 January 2005 to 11 January 2012), POPLINE (inception to 11

January 2012) and LILACS (1 January 2005 to 11 January 2012).

The search strategies are given in [Appendix 1](#).

Details of additional searching conducted for the initial version of this review are shown in [Appendix 2](#).

Searching other resources

We searched the reference lists of retrieved studies.

We did not apply any language restrictions.

Data collection and analysis

For this update, we used the methods described below when assessing the trials included from the new searches ([Shelley 2005](#); [Trinder 2006](#)). [Appendix 3](#) has the methods used for the initial review, which was published in 2006.

Selection of studies

We evaluated the trials using standard criteria without consideration of results ([Alderson 2004](#); [Moher 2001](#)). Two authors reviewed trials identified by the search strategy. We excluded trials without random allocation without further evaluation. We resolved discrepancies or disagreements by discussion or, if needed, through consultation with a third review author.

Data extraction and management

For eligible studies, two review authors extracted the data. We resolved discrepancies through discussion or, if required, consultation with a third author. One author entered data into [RevMan 2011](#) and a second author checked the entries for accuracy. When information in the reports was unclear, we attempted to contact authors of the original reports for further details.

Assessment of risk of bias in included studies

Two review authors independently assessed risk of bias for each study using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* ([Higgins 2011](#)). We resolved any disagreement by discussion or by involving a third assessor. For details, see [Characteristics of included studies](#), 'Risk of bias' tables.

Adequate sequence generation

We have listed the methods described in the reports. The risk of bias for methods in the included studies could be:

- low (adequate) - e.g., random number table or computer-generated random numbers; telephone or central randomization;
- unclear - insufficient information available on how the randomization sequence was generated;

- high (inadequate) - study may have used a non-random process, e.g., odd or even date of birth; hospital or clinic record number. However, we noted in the protocol that we would only include randomized controlled trials ([Criteria for considering studies for this review](#)).

Allocation concealment

We have noted whether allocation was concealed before assignment. We also provided information on whether the risk of bias for concealment appeared to be:

- low (adequate method) - telephone or central randomization; consecutively-numbered sealed opaque envelopes;
- unclear - insufficient information available to determine the adequacy of the methods, e.g., whether envelopes were opaque or not;
- high (inadequate method) - e.g., open allocation.

Blinding

Blinding of participants or study clinicians was not feasible for the interventions examined in this review. We searched the reports for methods used to blind assessors from knowledge of which intervention a participant received. The risk of bias could be:

- low - assessors blinded to study arm;
- unclear - insufficient information to determine whether any blinding of assessors occurred;
- high - assessors were not blinded to study arm.

Incomplete outcome data addressed

We describe the completeness of data, including losses to follow up and exclusions from the analysis, for the relevant outcomes. We noted reasons for losses or exclusions if available, and whether there were differential losses across the study groups. We noted whether incomplete outcome data was addressed. The risk of bias could be:

- low (adequate method) - loss information reported, losses less than or equal to 20% and similar across study arms, no inappropriate exclusions after randomization;
- unclear - report did not provide information on losses or any exclusions;
- high (inadequate method) - losses greater than 20% or losses differed substantially by study arm, inappropriate exclusions after randomization.

Free of selective reporting

We examined each report for any evidence of selective outcome reporting. We assessed whether studies appeared to be free of selective reporting and the risk of bias was assessed as:

- low (adequate method) - all of the study's pre-specified outcomes and all expected outcomes of interest to the review have been reported;
- unclear - insufficient information available to determine if selective reporting occurred;
- high (inadequate method) - the study's pre-specified outcomes were not reported; one or more primary outcomes were not pre-specified; results of an expected key outcome were not reported.

Other sources of bias

Where relevant, we list any important concerns we have about other possible sources of bias. These might include study being stopped early or study arms appearing unbalanced compared to the randomization information provided. We assessed whether each study appeared to be free of other sources of bias. The risk of bias was could be:

- low - no other apparent source of significant bias;
- unclear - other bias possible but insufficient information available to determine the extent;
- high - other source of bias likely, e.g., study funding source or potential conflicts of researchers.

Overall risk of bias

We judged whether studies were at high risk of bias, according to the criteria in [Higgins 2011](#). With the criteria above, we assessed the likely magnitude and direction of the bias and whether we considered it likely to have affected the results. We explored the impact of the level of bias through [Sensitivity analysis](#).

Measures of treatment effect

For dichotomous data, we calculated the Mantel-Haenszel risk ratio (RR) with 95% confidence interval (CI) using a fixed-effect model. For continuous data, if outcomes were measured in a similar way across trials, we computed the mean difference (MD) and 95% CI, also using a fixed-effect model. RevMan uses the inverse variance approach. We entered additional data such as medians into 'Other data' tables.

Dealing with missing data

For included studies, we noted losses to follow up or exclusions, but did not find any with high rates. The data in the present review were generally based on the analytic method used in the trial report (for example, intention- to- treat or per protocol). Any reasons for exception are given with the results. Where possible, we included all participants randomized to each group in the analyses, as per the group to which they were allocated. The denominator for each outcome in each trial is the number randomized minus any participants whose outcomes were missing.

Assessment of heterogeneity

We assessed statistical heterogeneity in each meta-analysis using the I^2 and Chi^2 statistics. We determined substantial heterogeneity to be present if I^2 was greater than 50% or if $P < 0.10$ in the Chi^2 test for heterogeneity.

We also looked for clinical heterogeneity, that is, variability in types of participants, interventions, or outcomes. However, we did not combine outcomes in a meta-analysis if they were very different.

Data synthesis

RevMan 2011 was used for statistical analysis. We used fixed-effect meta-analysis for combining data where the trials examined the same intervention and the trials' populations and methods were sufficiently similar. In the Results, we emphasized the important differences. That is, we included the estimates and CIs for the meta-analyses as well as other results that were significant ($P < 0.05$). The less important findings are mentioned, and the specific numbers can be found in the tables and figures.

After conducting the review, we assessed the quality of evidence using the GRADE approach (Higgins 2011). Grades could be high (randomized controlled trial), moderate, low, or very low. Randomized controlled trials were downgraded one level for each of the following: outcome was subject to bias due to the assessor not being blinded or self-report; losses were greater than 20% for the specific outcome. We presented the results for the meta-analyses in Table 1. Outcomes for which we could not conduct meta-analysis are summarized in Table 2.

Subgroup analysis and investigation of heterogeneity

In a subgroup analysis, we intended to examine outcomes for incomplete or inevitable miscarriage (where bleeding has already begun) versus non-viable pregnancy (without bleeding). For the participants having ultrasound examination, we also intended to examine outcomes for embryonic death (less than eight weeks gestation) versus fetal death (at least eight weeks gestation). However, we found no studies that reported data separately for non-viable pregnancies documented by ultrasound examination.

Sensitivity analysis

We had planned to remove studies with high losses in a sensitivity analysis. However, we did not have any included trials with known high losses. Some did not specify losses but the analyses generally appeared to include all women in their originally assigned groups. Due to the risk of bias in Thong 2002, we examined each meta-analysis containing that trial. We looked at whether the direction or significance of the results changed when Thong 2002 was removed from the analysis. Similarly, because the exact time frames for the assessments in Chipchase 1997 were unknown, we examined any meta-analysis containing that trial, with and without the Chipchase 1997 data.

RESULTS

Description of studies

An updated search of the Pregnancy and Childbirth Group's Trials Register identified one new trial report (Shelley 2005), which has been included. For the trial reports identified from the previous search (October 2009) we have included one trial (Trinder 2006), excluded one trial (Smith 2006) and identified an additional report of the Wieringa-de Waard 2002a (included study). One study, previously ongoing, has now been excluded (Schwarzler 2003). This updated review is now comprised of seven included studies and 10 excluded studies (see Characteristics of excluded studies). One trial report is awaiting classification in the next update (Wijesinghe 2011).

Included studies

Seven trials are now included in this review (Chipchase 1997; Karlsen 2001; Nielsen 1995; Shelley 2005; Thong 2002; Trinder 2006; Wieringa-de Waard 2002a). The studies compared expectant care versus surgical management of early pregnancy loss. Six trials reported on successful treatment, retained products of miscarriage, or the need for additional treatment. Only Chipchase 1997 did not report on these primary outcomes, but did provide data for the primary outcome of pelvic infection.

Observation periods varied across the studies. All but Wieringa-de Waard 2002a had at least a short-term follow-up of two weeks or less. Karlsen 2001 assessed the women seven to 10 days after randomization or the procedure. Nielsen 1995 followed the women in both expectant and surgical groups at three and 14 days after randomization. Thong 2002 provided data from two weeks after randomization, as well as data on complete miscarriages at seven weeks. Wieringa-de Waard 2002a reported measures at six weeks after allocation to the study arm. Chipchase 1997 conducted assessments at one and two weeks and at six months. Shelley 2005 assessed the outcomes at two and eight weeks. Trinder 2006 used a 10- to 14-day visit and an eight-week follow-up.

Some of these studies were limited by their sample sizes, with three having fewer than 100 participants (Karlsen 2001; Nielsen 1995; Shelley 2005). Three addressed sample size or power (Shelley 2005; Trinder 2006; Wieringa-de Waard 2002a), and all three had planned larger samples. Wieringa-de Waard 2002a had estimated 162 were needed, but only 122 of 449 eligible women consented to randomization. Shelley 2005 planned a sample size of 831. Recruitment was stopped after 1.5 years, because less than 50% eligible women had been approached to participate, and only 22% of those agreed to be randomized. Trinder 2006 had planned a sample size of 1422. Due to slow recruitment, even with an additional 33 months of recruitment, only 1200 were randomized. For further information, see Characteristics of included studies.

Risk of bias in included studies

Allocation

Three trials used central electronic randomization systems (Shelley 2005; Trinder 2006; Wieringa-de Waard 2002a) and therefore, were rated as 'low risk of bias' for sequence generation and allocation concealment. The randomization process was unclear in four studies. Chipchase 1997 and Thong 2002 did not provide information on the randomization methods, and the disparity in treatment group sizes in Thong 2002 raises concern. The likelihood of getting a disparity this large (122 versus 161) with simple randomization is 1% by binomial distribution. The trial was rated as 'high risk' for randomization sequence. No information was provided on whether there was some crossover from assigned to actual group. Karlsen 2001 and Nielsen 1995 allocated participants using sealed envelopes, but did not specify whether the envelopes were opaque or sequentially numbered. Mixing of the envelopes was not specified.

Blinding

Given the nature of the intervention, patients and clinicians involved in the procedures could not be blinded to the method of management. Whether those assessing the clinical outcomes were blinded to the group assignment is unknown.

Incomplete outcome data

No study had identifiable high losses. Most of the earlier studies did not report losses. Karlsen 2001 excluded three of the original 97 women from the analysis due to one withdrawal, one ectopic pregnancy, and one loss to follow up. The primary analysis for three trials appeared to include all randomized women in their originally assigned groups (Chipchase 1997; Nielsen 1995; Wieringa-de Waard 2002a). Some studies reported cross-over numbers, as women who had been allocated to the expectant-care group later requested surgical treatment. These included 25 women in Wieringa-de Waard 2002a and one in Nielsen 1995. Apart from Shelley 2005 and Trinder 2006, studies were rated as 'unclear' risk of bias for attrition bias.

The two most recent trials provided participant flow charts. Shelley 2005 and Trinder 2006 explained any losses or exclusions. For Shelley 2005, one woman in the surgical management group requested and received medical (drug) management instead. Losses to follow up were 1/14 from expectant group and 1/12 from the surgical management group. In Trinder 2006, 356 of the 402 assigned to surgical treatment actually had curettage; 30 (8%) miscarried before admission and 16 (4%) declined to have curettage after randomization. However, participants were analyzed in the groups to which they were allocated, with the exception of a viable

pregnancy in each of the comparison groups. Losses to follow up were 2.7% of the expectant group and 2.5% of surgical group.

Selective reporting

We did not detect any selective reporting; that is, all specific outcomes appeared to have been presented in the results. However, some of the shorter reports did not list the outcomes as specific objectives (Nielsen 1995; Thong 2002). We cannot be certain whether other outcomes were assessed but not reported.

Other potential sources of bias

Information on days of bleeding and pain came from participants' reports and diaries, which may have varied in consistency. Pregnancy and live births were also self-reported. However, under-reporting conception seems less likely for this type of trial than for a pregnancy-prevention study.

Chipchase 1997 was rated as 'unclear' risk of 'other' bias. The report does not mention when follow-up was obtained for most outcomes. Pregnancy was reported for the six-month timeframe.

Effects of interventions

The review includes data from seven trials where expectant care was compared with surgical management in cases of miscarriages. The trials had a total of 1931 participants; 1521 were in the study arms included in this review. Two trials had another study arm that received medical management (Trinder 2006, N = 398; Shelley 2005, N = 12). More than half of the participants in this review (N = 802) came from Trinder 2006.

We conducted sensitivity analysis by examining the meta-analyses that included Thong 2002, due to the potential risk of bias related to inadequate randomization. The direction and general significance of the results was not substantially altered in any meta-analysis when Thong 2002 was removed.

To enhance readability, this section emphasizes the important results. We present the risk ratio (RR), mean difference (MD) and confidence intervals (CI) for each meta-analysis, as well as the significant results ($P < 0.05$) for other analyses. All of the results can be viewed in the tables and figures.

Incomplete miscarriage

Five studies reported on retained products of conception, incomplete miscarriage, or spontaneous loss (Nielsen 1995; Shelley 2005; Thong 2002; Trinder 2006; Wieringa-de Waard 2002a). The expectant-care group was significantly more likely to have retained products of conception or incomplete miscarriage by two weeks (RR 3.98; 95% CI 2.94 to 5.38; four trials, 1263 women; Analysis 1.1). The results were similar when assessed at six to eight weeks (RR 2.56; 95% CI 1.15 to 5.69; three trials, 430 women; Analysis

1.2). When [Thong 2002](#) was removed for sensitivity analysis, the results did not change substantively.

Clinical need for additional or unplanned surgery

Five studies reported on the need for unplanned surgical treatment ([Karlsen 2001](#); [Nielsen 1995](#); [Thong 2002](#); [Trinder 2006](#); [Wieringa-de Waard 2002a](#)). The need was significantly greater for women in the expectant-care group when the studies were combined (RR 7.35; 95% CI 5.04 to 10.72; five trials, 1454 women; [Analysis 1.3](#)). This meta-analysis showed substantial heterogeneity (P value = 0.07; I^2 = 55%). We examined the results after removing [Thong 2002](#), which had unbalanced study arms with no explanation. [Thong 2002](#) was also unclear about the timeframe for this outcome. With the remaining four trials, the heterogeneity was moderate (P value = 0.20; I^2 = 36%), and the results were similar to those from the original analysis (RR 7.89; 95% CI 5.34 to 11.68; four trials, 1171 women; [Analysis 1.4](#)).

The percentages of women in the expectant-care group needing surgical management ranged from 2% to 44% with a mean of 28% (215/772). Within the surgical-treatment group, the percentages needing additional surgery ranged from zero to 5% with a mean of 4% (27/682). In [Nielsen 1995](#), 20 of the 103 expectant-care group needed surgical treatment by 14 days, and one had an operation on request. No women in the surgical group required additional operations. In [Karlsen 2001](#), seven of the 46 women in the observational group had surgical evacuation by 10 days. This was generally due to unacceptable pain or bleeding. [Wieringa-de Waard 2002a](#) reported the need for surgical treatment in seven of the 64 expectant-care women by six weeks. An additional 25 had surgical intervention on request. [Thong 2002](#) reported surgical treatment was needed for three of the 161 women in the expectant-care group. In [Trinder 2006](#), 44% of the expectant-care group (177/398) had unplanned curettage, compared with 5% (22/402) of those with surgical management. About half of those women had the unplanned curettage before the 10- to 14-day visit, while the others had the additional treatment at the follow-up visit or later.

Pelvic infection

All seven studies reported the number of women with pelvic infection. Pelvic infection was similar between the study groups up to eight weeks (RR 0.63; 95% CI 0.36 to 1.12; seven trials, 1514 women; [Analysis 1.5](#)). The proportions of women diagnosed with infection ranged from zero to 10%. Three trials reported no cases of pelvic infection in either study group ([Karlsen 2001](#); [Shelley 2005](#); [Wieringa-de Waard 2002a](#)). When [Thong 2002](#) was removed for sensitivity analysis, the results did not change substantively. The results were also examined without [Chipchase 1997](#), because the exact timeframe for assessment was not known, but the results did not change meaningfully.

Bleeding

The reporting of bleeding complications varied across the seven studies. Bleeding was reported as mean number of days in [Karlsen 2001](#) and [Nielsen 1995](#). The expectant-care group had 1.59 (MD) more days of bleeding (95% CI 0.74 to 2.45; [Analysis 1.6](#)). In [Karlsen 2001](#), the amount of bleeding was also subjectively reported on a three-point 'scale'. Although means and standard deviations were provided, categorical data may have better represented such a measure, so we did not include those data. [Shelley 2005](#) analyzed bleeding categorically (less than or equal to three days, four to eight days, and equal to or greater than nine days). The comparison groups were similar in the numbers with bleeding that lasted nine days or more ([Analysis 1.8](#)).

Three trials reported bleeding with median numbers of days ([Chipchase 1997](#); [Trinder 2006](#); [Wieringa-de Waard 2002a](#)). [Chipchase 1997](#) provided the ranges, and reported no significant difference. [Wieringa-de Waard 2002a](#) and [Trinder 2006](#) gave the 25th and 75th (interquartile) percentiles. Both reported that the expectant-care group had significantly longer bleeding than the surgical-treatment group ([Analysis 1.7](#)): 17 versus 13 days for [Wieringa-de Waard 2002a](#) and 12 versus eight days in [Trinder 2006](#).

The need for transfusion was greater for the expectant care group, largely due to the seven women who needed transfusion in [Trinder 2006](#). The risk ratio was (RR 6.45; 95% CI 1.21 to 34.42; three trials, 1205 women [Analysis 1.9](#)). [Wieringa-de Waard 2002a](#) and [Thong 2002](#) each had one woman in the expectant-care group who needed transfusion. The mean percentages needing transfusion were 1.4% in the expectant-care group (9/623) and zero in the surgical-management group (0/582). The risk of hemorrhage greater than 500 mL was not significantly different for the groups in [Wieringa-de Waard 2002a](#). The expectant-care group had two cases and the surgical-treatment group had one. When [Thong 2002](#) was removed for sensitivity analysis, the results did not change substantively.

Pain

Six studies reported on pain, and the outcome measures varied here as well. Pain was reported as mean number of days in [Nielsen 1995](#) and with a pain scale in [Karlsen 2001](#). No significant differences in pain emerged in [Nielsen 1995](#). The mean pain score was significantly greater for the expectant-care group in [Karlsen 2001](#), but the authors claimed the pain was usually mild to moderate. The MD was 0.70 (95% CI 0.30 to 1.10; [Analysis 1.13](#)). To assess pain, [Trinder 2006](#) used extra analgesic taken. The expectant-care group was more likely to use extra analgesic than the surgical-treatment group (RR 2.52; 95% CI 1.98 to 3.19, [Analysis 1.14](#)). Three trials reported the days of pain as medians ([Chipchase 1997](#); [Shelley 2005](#); [Wieringa-de Waard 2002a](#)). The comparison groups were similar for median days within those trials.

Costs and sick leave

Trinder 2006 was the only trial with cost estimates. A secondary report examined hospital costs and the costs of “broader impacts,” e.g., community care, travel costs, and lost productivity. Total costs were lower for expectant care than for surgical treatment. The MD (in UK pounds sterling) was -499.10 (95% CI -613.04 to -385.16; Analysis 1.15).

Four studies reported days of sick leave or days to return to usual activities (Chipchase 1997; Nielsen 1995; Shelley 2005; Trinder 2006). Measures included means, medians, and days categorized. Nielsen 1995 and Shelley 2005 showed no significant differences between the two groups. Chipchase 1997 and Trinder 2006 reported median numbers of days, but each noted that the study arms were similar.

Psychosocial outcomes

Psychosocial outcomes were examined in four studies (Chipchase 1997; Nielsen 1995; Shelley 2005; Trinder 2006). Measures included anxiety and depression, the SF-36 (short-form health survey with 36 questions), and participant satisfaction.

In Nielsen 1995, the two study arms were similar for the anxiety inventory, as reported in the 1996 paper. This outcome was assessed in a smaller group of 86 women who spoke Swedish. Within the expectant management group, those who had complete miscarriage in three days had a similar mean anxiety score compared with those who had surgical treatment due to incomplete miscarriage. The trends were similar for the visual analogue items, but the results were described for the nine items individually and there was no overall score. Shelley 2005 and Trinder 2006 used the Hospital Anxiety and Depression Scale (HADS) and the SF-36. The eight sub-scales of the SF-36 comprise the two summary measures of mental and physical health. The instruments were administered at both two and eight weeks. The eight-week assessments from Shelley 2005 were used here, on the assumption that any differences at two weeks may not be clinically important. The researchers compared those with a HADS score of at least 11. The expectant-care and surgical-management groups were similar for all four scales in Shelley 2005, and reportedly also similar in Trinder 2006.

Chipchase 1997 and Shelley 2005 reported on women's satisfaction with their management. Chipchase 1997 provided no information on the measure used. Reportedly, all 19 women in the expectant-care group were satisfied with their conservative management, compared with 14 of 16 women with surgical management, due to the delays between diagnosis and operation. Shelley 2005 asked the women if they would choose the same method of care again. The groups were similar in their responses. The results were examined without Chipchase 1997, since the timeframe for assessment was not known, but the overall result did not change. Both studies had small samples.

Pregnancy or live births

Future pregnancies or births were reported in Chipchase 1997 and Trinder 2006. Data were limited to the women who attempted pregnancy or who expressed the desire to become pregnant after the miscarriage. Chipchase 1997 reported pregnancies after management, and the study arms were similar. For Trinder 2006, a 2009 paper reported on pregnancies and live births after long-term follow-up. The response rate to the questionnaire was 68%. The overall pregnancy rate was reportedly 84%. Live births by five years were similar for the expectant-care and surgical-management groups. Time to subsequently giving birth was shown by study arm in a figure; the researchers reported the groups were similar. The researchers also reported that analysis of time to first pregnancy was similar to that for live births.

Two 1997 papers from Nielsen 1995 reported on pregnancy rates among women attempting conception up to 24 months. For those who returned questionnaires of those who wished to become pregnant, pregnancy rates were similar for the two study arms. However, information was insufficient to evaluate fertility after the miscarriage.

Other outcomes

There were limited data reported for other outcomes. Wieringa-de Waard 2002a noted only one case with cervical tear in the expectant-care group and no cases of uterine perforation. Karlsen 2001 reported no perioperative complications in either group and no endometritis. Nielsen 1995 listed the number of total complications and described each.

The trials did not specifically report data on our other primary outcomes of complications requiring hysterectomy, admission to intensive care unit, and death. Also, they did not mention the secondary outcome of intrauterine adhesions.

DISCUSSION

Summary of main results

Miscarriage remains a common outcome of pregnancy, affecting millions of women annually. For generations, the management has been dictated by concerns about infection and hemorrhage, but the scientific basis for routine intervention was weak. Recent randomized controlled trials suggest that routine surgical evacuation has no clear superiority over expectant management. Although most of trials were of limited size and quality, one was good quality and adequately powered. These trials indicate no serious medical risks associated with watchful waiting until completion, with the exception of hemorrhage severe enough to require transfusion. No increased risk of infection was seen. Efficacy of antibiotics for

treating pelvic infection was not available in the included studies. However, antibiotic prophylaxis for incomplete abortion has been reviewed elsewhere (May 2007).

The principal outcomes of interest were incomplete miscarriage and the need for surgical completion. These problems were more common in the expectant-care group than in the surgical group. However, because the outcome assessors were unlikely to have been blinded to treatment group, information bias may have influenced these results. Gynecologists accustomed to routine surgical evacuation may have readily recommended an operation when none was medically necessary. Early experience with medical abortion supports this hypothesis. Physicians inexperienced with medical abortion are more likely to intervene with surgical evacuation than are those experienced with a passive approach to completion. As experience with medical abortion grows, rates of surgical intervention decline (Cabezas 1998; Winikoff 1996).

Bleeding was more common with expectant management. Nine women needed blood transfusion of the 623 with expectant care and none of the 582 with surgical management. Hemorrhage can occur with miscarriage, and can be dangerous. Indeed, hemorrhage is the second most common cause of death related to miscarriage in the United States (Saraiya 1999). Prompt transport to a hospital with facilities for volume expansion and blood transfusion is important if heavy bleeding cannot be quickly controlled by medical or surgical means.

The cost of health care is an increasing concern, both for the patient and the healthcare system. Trinder 2006 was the only study to examine the economic impact in a secondary paper. The costs for hospital care and broader impacts, such as travel costs and lost productivity, were significantly greater for surgical management.

Overall completeness and applicability of evidence

Since our original review, two trials were published that compared expectant management, medical management such as administration of misoprostol, and surgical evacuation. While one was substantially smaller than planned (Shelley 2005), the other was a large, good-quality trial (Trinder 2006).

When surgical evacuation is chosen in this setting, either manual vacuum aspiration or aspiration with an electric suction pump is appropriate. A systematic review of the two techniques found no major differences in the two approaches (Wen 2008). However, women tend to find the noise of the electric pump unsettling (Dean 2003).

The availability of medical (drug) management, for example with misoprostol, has added another important option for women with miscarriage (Blanchard 2004; Chen 2007; Graziosi 2004). Women no longer have to choose between an operation and doing nothing. Misoprostol can be given vaginally, orally, under the tongue, or against the cheek (Neilson 2006; Neilson 2010). Non-oral routes of administration appear more effective than oral. The optimal

regimen of misoprostol remains unclear. Higher doses are associated with more prostaglandin side effects, including diarrhea and fever. We excluded studies of medical management for miscarriage, which is examined in other reviews (Neilson 2006; Neilson 2010).

Quality of the evidence

All the studies were randomized controlled trials, and none had high losses to follow up. Most had no obvious risk of bias. However, information on study design and implementation was lacking for the earlier studies. One trial had unbalanced study arms, but removing that trial did not affect any of the important differences between the study arms.

We assessed the quality of evidence using the GRADE approach (Table 1; Table 2). The quality was considered to be moderate for our primary outcomes of incomplete miscarriage and need for additional or unplanned surgical evacuation; quality was high for the data on pelvic infection. For our secondary outcomes, the quality was moderate or low except for the cost results, which we considered high quality.

AUTHORS' CONCLUSIONS

Implications for practice

The existing evidence does not indicate the superiority of either expectant care or surgical treatment. If women can accept a higher rate of incomplete miscarriage, need for later surgical evacuation, and need for blood transfusion, watchful waiting is a reasonable course of action. The policy of routine uterine evacuation lacks scientific support. Infection rates did not differ, although transfusion rates did. Costs were higher for surgical management. Given the evidence, women's preferences should play a large role in management plans.

Implications for research

One large trial of good quality compared expectant care with surgical management. Medical management was also examined in that trial and in another smaller one, but was not reviewed here. Several studies were underpowered. Studies evaluating expectant management without ultrasound examination would also be of interest. Lastly, studies need to separate outcomes for pregnancies found to be non-viable by ultrasound examination (without bleeding or pain).

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Chipchase 1997

Methods	Randomized controlled trial. Report provided no a priori hypothesis or sample size and power calculation. Women were assessed at 1 week, 2 weeks, and 6 months after inclusion	
Participants	35 women with retained products of conception after spontaneous miscarriage	
Interventions	Expectant care (N = 19) or surgical evacuation (N = 16).	
Outcomes	Number of days of pain, vaginal bleeding, that normal daily routine was disrupted (sick leave); time taken for next normal period to occur, any treatment for complications, time taken for the next spontaneous pregnancy (number conceived by 6 months of those who attempted) and participants' satisfaction (number satisfied)	
Notes	Attempts to contact the researcher for additional data were unsuccessful	
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No information.
Allocation concealment (selection bias)	Unclear risk	No information.
Blinding (performance bias and detection bias) All outcomes	Unclear risk	No information.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	All women randomized were apparently included in the analysis. No mention of losses
Selective reporting (reporting bias)	Low risk	All specified outcomes were reported in the paper.
Other bias	Unclear risk	Women were assessed at 1 week, 2 weeks, and 6 months. However, authors did not report when follow-up data were obtained for most outcomes. Pregnancy was reported for the 6-month timeframe

Karlsen 2001

Methods	Randomized controlled trial. Women were assessed at 7 to 10 days and were offered another appointment if desired
Participants	97 women with first trimester spontaneous miscarriage. Excluded women with > 12 weeks amenorrhea, > 20 mm residual volume of tissue in uterus by ultrasound, unacceptable pain or bleeding
Interventions	Expectant care (N = 48) or surgical evacuation (N = 46).
Outcomes	Need for (additional) surgical treatment, operative complications, endometritis, number of days of bleeding, amount of bleeding (scale), pain (scale), unscheduled consultation
Notes	Researcher provided additional data on request (means and standard deviations for days of bleeding, bleeding scale, and pain scale). However, we used the reported results in this review

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No information.
Allocation concealment (selection bias)	Unclear risk	Groups randomized by choosing a sealed envelope.
Blinding (performance bias and detection bias) All outcomes	Unclear risk	No information.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	3 women (3%) excluded from analysis: 1 withdrew, 1 had ectopic pregnancy, and 1 was lost to follow up. Report did not specify to which group these women had been allocated
Selective reporting (reporting bias)	Low risk	All specified outcomes were reported.
Other bias	Low risk	No other bias identified.

Nielsen 1995

Methods	Randomized controlled trial at 1 hospital. Report did not contain an a priori hypothesis or sample size and power calculation. Assessments done at 3 days and 14 days.
Participants	155 women in Sweden with inevitable or incomplete miscarriage; 86 of the 155 women participated in the survey on psychological outcomes Questionnaire was given to all women randomized starting August 1993 (about half-

Nielsen 1995 (Continued)

	way through the study)	
Interventions	Expectant care (N = 103) Surgical treatment (dilation and curettage) (N = 52).	
Outcomes	For 155 women: number of days with pain, number of days with vaginal bleeding, convalescence time, and complications, in particular, pelvic infection. Secondary paper with 86 women who spoke Swedish: visual analog scales (9 items) regarding miscarriage, the present situation, and worries about future pregnancies. Spielberger State Anxiety Inventory had 30 adjectives regarding affective states. Later paper reported on subsequent conceptions.	
Notes		
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No information other than allocation was 2:1 (expectant versus surgical)
Allocation concealment (selection bias)	Unclear risk	Sealed envelopes were withdrawn from a box.
Blinding (performance bias and detection bias) All outcomes	Unclear risk	No information.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Analysis appears to have included all women randomized. No mention of losses
Selective reporting (reporting bias)	Low risk	The analysis section identified the outcomes that were examined, and all were included in the results. Study purpose did not list the specific outcomes, however
Other bias	Low risk	No other bias identified.

Shelley 2005

Methods	Randomized controlled trial with 5 participating hospitals. Sample size calculation based on 80% power to detect 5% difference in successful evacuation (see Notes below). Assessments done at 10- to 14-day visits and at 8 weeks.
Participants	39 women with inevitable or incomplete first trimester miscarriage. Inclusion criteria: gestational age ≤ 13 weeks, bleeding not excessive, stable hemodynamic system, temperature ≤ 37.5°C, no serious systemic medical or surgical condition,

	use of prostaglandins not contraindicated, ≥ 18 years old, not taking anticoagulants or oral corticosteroids, singleton pregnancy, no intrauterine device, and English sufficient for written questionnaire. Exclusion criteria: non-viable intrauterine pregnancy on ultrasound but no vaginal bleeding
Interventions	Expectant care (N = 15) given contact phone number and information sheet with expected symptoms/signs and indications that care was required. Surgical management (N = 12) by aspiration curettage or by dilation and curettage, depending on hospital and practitioner. Medical intervention (N = 12) not addressed in this review.
Outcomes	Primary: effective evacuation of uterus without unplanned surgical evacuation. Secondary: infection, hemorrhage, pain, bleeding, physical and emotional recovery (SF-36 ¹), anxiety and depression from the Hospital Anxiety and Depression Scale. Questionnaire completed at 10- to 14-day visit to hospital or local physician; second questionnaire mailed at 8 weeks
Notes	Randomized: 12 surgical, 15 expectant, 12 medical. Study was planned to be much larger (sample size 831). Recruitment was stopped after 1.5 years. Less than 50% eligible women were approached to participate, and 22% of those agreed to be randomized

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Generated by co-ordinating center using biased coin method of maintaining balance between study arms; stratified by hospital and gestation (≤ 7 weeks, 8 to 20 weeks, 11 to 13 weeks)
Allocation concealment (selection bias)	Low risk	Centralized computer-based service via telephone 24 hours.
Blinding (performance bias and detection bias) All outcomes	Low risk	Data analyst had access to unblinded data but no participant contact
Incomplete outcome data (attrition bias) All outcomes	Low risk	Participant flow chart provided. Lost to follow up at 8 weeks: expectant 1/14 (7%) ; surgical 1/12 (8%). Of surgical management group, 1 requested and received medical management instead
Selective reporting (reporting bias)	Low risk	Report includes data by study arm for all specified outcomes

Shelley 2005 (Continued)

Other bias	Low risk	No other bias identified.
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Thong 2002

Methods	Randomized controlled trial. Assessments were done up to 14 days. Expectant care was extended by additional 5 weeks to assess outcome of miscarriage
Participants	283 women with incomplete miscarriage or non-viable pregnancy
Interventions	Expectant care (N = 161) versus surgical management (curettage) (N = 122)
Outcomes	Completion of miscarriage within two and seven weeks, pelvic infection, need for repeat curettage or suction evacuation due to heavy vaginal bleeding, blood transfusion needed
Notes	Another 85 women, managed according to their choice, not included in analysis. Abstract only available. Attempts to contact authors regarding full report were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Of the 283 randomized, 161 (57%) were managed conservatively and 122 (43%) surgically. No information provided on whether there was some crossover from assigned to actual group
Allocation concealment (selection bias)	Unclear risk	No information.
Blinding (performance bias and detection bias) All outcomes	Unclear risk	No information.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information in abstract to assess this factor.
Selective reporting (reporting bias)	Unclear risk	Insufficient information in abstract. Objective addressed safety and efficacy
Other bias	Unclear risk	Abstract had limited information; assessment of other bias was not feasible

Trinder 2006

Methods	Randomized controlled trial with 7 participating hospitals. Sample size calculation based on 80% power to detect 50% lower incidence of primary outcome in surgical group versus expectant or medical management group. Assessments done at 10- to 14-day visits and at 8 weeks.
Participants	1200 women with incomplete miscarriage or early fetal or embryonic demise (< 13 weeks gestation). Exclusion criteria: severe hemorrhage or pain, pyrexia above 37.5°C, severe asthma, hemolytic disease or blood dyscrasias, current anticoagulation or systemic corticosteroid treatment, twin or higher order pregnancy, smoker aged > 35 years, and inability to understand written English
Interventions	All women received information sheet, 30 co-dydramol tablets, and emergency phone number. Expectant management (N = 399). Surgical management (N = 403) by suction curettage. Medical management (N = 398) not addressed in this review.
Outcomes	Primary: documented gynecological infection within 14 days. Secondary: treatment with antibiotics for presumed gynecological infection within 14 days and within 8 weeks; duration of clinical symptoms (pain, additional analgesia, vaginal bleeding, days off work, days before return to usual daily activities); complications (fall in hemoglobin at 10 to 14 days, blood transfusion, unplanned consultations or admissions within 14 days and within 8 weeks); efficacy-no unplanned surgical curettage within 8 weeks; psychological outcomes (depression and anxiety on the Hospital Anxiety and Depression Scale at 8 weeks); and return to normal activity (standard UK SF-36 ²). Secondary papers reported on 1) live births by 5 years; 2) costs during first 8 weeks
Notes	Planned sample size was 1422. Due to slow recruitment, even with additional 33 months of recruitment, 1200 were randomized (expectant 399, surgical 403, medical 398)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Central telephone system; minimization for comparability regarding center, miscarriage type, and gestation
Allocation concealment (selection bias)	Low risk	Central telephone system.
Blinding (performance bias and detection bias) All outcomes	Unclear risk	None mentioned.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Participant flow chart provided. Viable pregnancy determined for 1 each of expectant and surgical groups. Lost to follow up (< 14 days and 8 weeks): expectant, 5 and

Trinder 2006 (Continued)

		6, respectively (11/398 = 2.7%); surgical, 8 and 2, respectively (10/402 = 2.5%)
Selective reporting (reporting bias)	Low risk	Report includes results by study arm for specified outcomes.
Other bias	Low risk	No other bias identified.

Wieringa-de Waard 2002a

Methods	Randomized controlled trial in 2 hospitals. Sample size to detect a difference of 20% in efficacy with 80% power; no alpha mentioned; had 162 total. Women were assessed at bi-weekly visits for up to 3 months. Success of intervention was assessed at 6 weeks.
Participants	122 women with diagnosis of early fetal demise or incomplete miscarriage at < 16 weeks. Excluded women under 18 years; those with severe bleeding, pain, or fever; and those who could not understand Dutch or English
Interventions	Expectant care (N = 64) or suction curettage (N = 58).
Outcomes	Complications: excessive bleeding (> 500 mL), genital infection, cervical tear, uterine perforation, intrauterine synechiae. Efficacy: completion of miscarriage within 6 weeks (for expectant group) or no need for repeat curettage within 6 weeks (for surgical group). Duration of symptoms: self-reported days of bleeding and pain, emergency curettage
Notes	Of 427 eligible women, 122 agreed to be randomized. 305 women expressed preference for treatment and were included in observational arm of study. Researcher provided additional means and standard deviations on request. However, we used the reported medians in this review Additional report identified: Wieringa-de Waard 2002b - secondary paper presenting same data on mental health as a figure. Another figure showed women randomized versus those who chose intervention

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Attending physician used central electronic randomization; stratified for referral setting and gestational age
Allocation concealment (selection bias)	Low risk	Central electronic randomization.

Wieringa-de Waard 2002a (Continued)

Blinking (performance bias and detection bias) All outcomes	Unclear risk	No information.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Primary analysis included all women randomized. No mention of losses
Selective reporting (reporting bias)	Low risk	Study outcomes were specified. Report had results for all outcomes
Other bias	Low risk	No other bias identified.

¹ Reference cites the MOS (Medical Outcomes Study) 36-item short-form health survey (SF-36)

² May be Short Form 36 Health Survey noted above, but the authors do not specify

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Gazvani 2000	This abstract has insufficient data for analysis. Wrote to Dr Gazvani. A 2004 publication reports on manual vacuum aspiration but has no comparison data or any data on expectant care
Gronlund 2002	Observational study - not a RCT.
Leung 2004	This trial did not meet the eligibility criteria for the review. All women were treated with misoprostol before randomization, and this review excludes medical management
Ogden 2001	Study failed, according to investigator (2004). There were no trial data. Women did not want to be randomized, since study did not offer more than usual practice
Schwarzler 2003	Abstract did not provide comparative data (104 randomized: 48 D&C; 56 conservative management). In 2004, researcher was going to write up the report. In Jan 2011, no relevant publication found in MEDLINE nor any papers for Schwarzler after 2005
Shehata 2000	Abstract was interim. There were no outcome data. Wrote to Dr Mahmood, but he had not yet written the report. Later found Thong 2002 , which may be related, but the sample sizes differed, as this abstract was interim. Wrote to Dr Thong, but did not receive a reply. Did not locate Dr Shehata
Smith 2006	Qualitative study with sub-sample of 56 participants from Trinder 2006 plus 16 non-participants.
Ulstrup 1997	This abstract did not provide outcome data. Attempted (unsuccessfully) to contact Dr Ulstrup and the 3 co-authors. Also wrote to a co-author on another recent paper, but did not receive a reply

(Continued)

Wieringa-de Waard 2002b	Related to Wieringa-de Waard 2002a . However, in this report, it was not possible to separate the 39% of those randomized to expectant management who later chose to undergo surgical treatment. The authors noted they analyzed by intention-to-treat. Mixing the two subgroups may have led to more favorable results that were not associated with the study arm. It could also have led to more variability in the data that masked a potential effect
Wieringa-de Waard 2004a	Follow-up study of RCT with different comparisons. Of the 122 randomized, 55 responded to a follow-up survey. They were compared with 81 women who chose not to be randomized

RCT: randomized controlled trial

DATA AND ANALYSES

Comparison 1. Expectant care versus surgical treatment for miscarriage

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Miscarriage not complete (<= 2 weeks)	4	1263	Risk Ratio (M-H, Fixed, 95% CI)	3.98 [2.94, 5.38]
2 Miscarriage not complete (6 to 8 weeks)	3	430	Risk Ratio (M-H, Fixed, 95% CI)	2.56 [1.15, 5.69]
3 Needed (additional or unplanned) surgical evacuation	5	1454	Risk Ratio (M-H, Fixed, 95% CI)	7.35 [5.04, 10.72]
4 Needed (additional or unplanned) surgical evacuation (sensitivity analysis)	4	1171	Risk Ratio (M-H, Fixed, 95% CI)	7.89 [5.34, 11.68]
5 Localized pelvic infection by 8 weeks	7	1514	Risk Ratio (M-H, Fixed, 95% CI)	0.63 [0.36, 1.12]
6 Mean (standard deviation) days of bleeding	2	249	Mean Difference (IV, Fixed, 95% CI)	1.59 [0.74, 2.45]
7 Days of bleeding reported as medians			Other data	No numeric data
8 Bleeding >= 9 days	1	25	Risk Ratio (M-H, Fixed, 95% CI)	1.38 [0.54, 3.52]
9 Bleeding with need for transfusion	3	1205	Risk Ratio (M-H, Fixed, 95% CI)	6.45 [1.21, 34.42]
10 Hemorrhage > 500 mL	1	122	Risk Ratio (M-H, Fixed, 95% CI)	1.81 [0.17, 19.47]
11 Mean (standard deviation) days of pain	1	155	Mean Difference (IV, Fixed, 95% CI)	0.23 [-0.26, 0.72]
12 Days of pain reported as medians			Other data	No numeric data
13 Pain (scale 0 to 3)	1	94	Mean Difference (IV, Fixed, 95% CI)	0.7 [0.30, 1.10]
14 Extra analgesic taken	1	800	Risk Ratio (M-H, Fixed, 95% CI)	2.52 [1.98, 3.19]
15 Costs by 8 weeks for hospital care and broader impacts (UK pounds sterling, 2001-02 prices)	1	800	Mean Difference (IV, Fixed, 95% CI)	-499.10 [-613.04, -385.16]
16 Days of sick leave reported as medians			Other data	No numeric data
17 Days of sick leave after management of miscarriage	1	155	Mean Difference (IV, Fixed, 95% CI)	-0.19 [-1.54, 1.16]
18 Days to return to usual activities >= 7	1	25	Risk Ratio (M-H, Fixed, 95% CI)	3.14 [0.83, 11.92]
19 Participant satisfaction with management	2	60	Risk Ratio (M-H, Fixed, 95% CI)	1.11 [0.87, 1.44]
20 State anxiety inventory	1	86	Mean Difference (IV, Fixed, 95% CI)	0.0 [-6.09, 6.09]
21 State anxiety inventory within expectant care group	1	58	Mean Difference (IV, Fixed, 95% CI)	-5.5 [-12.73, 1.73]
22 HADS Anxiety >=11 at 8 weeks	1	24	Risk Ratio (M-H, Fixed, 95% CI)	3.57 [0.49, 26.07]

Expectant care versus surgical treatment for miscarriage (Review)

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23 HADS Depression ≥ 11 at 8 weeks	1	24	Peto Odds Ratio (Peto, Fixed, 95% CI)	6.54 [0.59, 72.21]
24 SF-36 Mental health scale at 8 weeks	1	26	Mean Difference (IV, Fixed, 95% CI)	-2.60 [-13.88, 8.68]
25 SF-36 Physical health scale at 8 weeks	1	26	Mean Difference (IV, Fixed, 95% CI)	3.40 [-4.20, 11.00]
26 Subsequent conception	1	21	Risk Ratio (M-H, Fixed, 95% CI)	1.13 [0.64, 1.98]
27 Live births by 5 years	1	459	Risk Ratio (M-H, Fixed, 95% CI)	0.97 [0.88, 1.06]
28 Cervical tear	1	122	Risk Ratio (M-H, Fixed, 95% CI)	2.72 [0.11, 65.56]
29 Endometritis	1	94	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
30 Perioperative complications	1	94	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 1.1. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 1 Miscarriage not complete (≤ 2 weeks).

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 1 Miscarriage not complete (≤ 2 weeks)

Analysis 1.2. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 2 Miscarriage not complete (6 to 8 weeks).

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 2 Miscarriage not complete (6 to 8 weeks)

Analysis 1.3. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 3 Needed (additional or unplanned) surgical evacuation.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 3 Needed (additional or unplanned) surgical evacuation

Analysis 1.4. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 4 Needed (additional or unplanned) surgical evacuation (sensitivity analysis).

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 4 Needed (additional or unplanned) surgical evacuation (sensitivity analysis)

Analysis 1.5. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 5 Localized pelvic infection by 8 weeks.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 5 Localized pelvic infection by 8 weeks

Analysis 1.6. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 6 Mean (standard deviation) days of bleeding.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 6 Mean (standard deviation) days of bleeding

Analysis 1.7. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 7 Days of bleeding reported as medians.

Days of bleeding reported as medians

Study	Study group	Median	Range	Percentiles: 25th, 75th
Chipchase 1997	Expectant care	4	0 to 7	
Chipchase 1997	Surgical treatment	2	0 to 7	
Trinder 2006	Expectant care	12		7, 15
Trinder 2006	Surgical treatment	8		4, 14
Wieringa-de 2002a	Waard Expectant care	17		10, 26
Wieringa-de 2002a	Waard Surgical treatment	13		9, 17

Analysis 1.8. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 8 Bleeding ≥ 9 days.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 8 Bleeding ≥ 9 days

Analysis 1.9. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 9 Bleeding with need for transfusion.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 9 Bleeding with need for transfusion

Analysis 1.10. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 10 Hemorrhage > 500 mL.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 10 Hemorrhage > 500 mL

Analysis 1.11. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 11 Mean (standard deviation) days of pain.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 11 Mean (standard deviation) days of pain

Analysis 1.12. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 12 Days of pain reported as medians.

Days of pain reported as medians

Study	Study group	Median days	Range	Percentiles:25th and 75th
Chipchase 1997	Expectant care	0	0 to 5	
Chipchase 1997	Surgical treatment	0	0 to 2	
Shelley 2005	Expectant care	3	0.0 to 11.0	
Shelley 2005	Surgical treatment	2	0.2 to 12.0	
Wieringa-de Waard 2002a	Expectant care	14		7, 24
Wieringa-de Waard 2002a	Surgical treatment	11		6, 26

Analysis 1.13. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 13 Pain (scale 0 to 3).

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 13 Pain (scale 0 to 3)

Analysis 1.14. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 14 Extra analgesic taken.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 14 Extra analgesic taken

Analysis 1.15. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 15 Costs by 8 weeks for hospital care and broader impacts (UK pounds sterling, 2001-02 prices).

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 15 Costs by 8 weeks for hospital care and broader impacts (UK pounds sterling, 2001-02 prices)

Analysis 1.16. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 16 Days of sick leave reported as medians.

Days of sick leave reported as medians

Study	Study group	Median days	Range
Chipchase 1997	Expectant care	4	0 to 28
Chipchase 1997	Surgical treatment	6.5	0 to 7
Trinder 2006	Expectant care	8	---
Trinder 2006	Surgical treatment	9	---

Analysis 1.17. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 17 Days of sick leave after management of miscarriage.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 17 Days of sick leave after management of miscarriage

Analysis 1.18. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 18 Days to return to usual activities ≥ 7 .

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 18 Days to return to usual activities ≥ 7

Analysis 1.19. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 19 Participant satisfaction with management.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 19 Participant satisfaction with management

Analysis 1.20. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 20 State anxiety inventory.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 20 State anxiety inventory

Analysis 1.21. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 21 State anxiety inventory within expectant care group.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 21 State anxiety inventory within expectant care group

Analysis 1.22. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 22 HADS Anxiety ≥ 11 at 8 weeks.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 22 HADS Anxiety ≥ 11 at 8 weeks

Analysis 1.23. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 23 HADS Depression ≥ 11 at 8 weeks.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 23 HADS Depression ≥ 11 at 8 weeks

Analysis 1.24. Comparison I Expectant care versus surgical treatment for miscarriage, Outcome 24 SF-36 Mental health scale at 8 weeks.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: I Expectant care versus surgical treatment for miscarriage

Outcome: 24 SF-36 Mental health scale at 8 weeks

Analysis 1.25. Comparison I Expectant care versus surgical treatment for miscarriage, Outcome 25 SF-36 Physical health scale at 8 weeks.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: I Expectant care versus surgical treatment for miscarriage

Outcome: 25 SF-36 Physical health scale at 8 weeks

Analysis 1.26. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 26 Subsequent conception.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 26 Subsequent conception

Analysis 1.27. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 27 Live births by 5 years.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 27 Live births by 5 years

Analysis 1.28. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 28 Cervical tear.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 28 Cervical tear

Analysis 1.29. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 29 Endometritis.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 29 Endometritis

Analysis 1.30. Comparison 1 Expectant care versus surgical treatment for miscarriage, Outcome 30 Perioperative complications.

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 1 Expectant care versus surgical treatment for miscarriage

Outcome: 30 Perioperative complications

Study or subgroup	Expectant n/N	Surgical n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Karlsen 2001	0/46	0/48			Not estimable
Total (95% CI)	46	48			Not estimable
Total events: 0 (Expectant), 0 (Surgical)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Test for subgroup differences: Not applicable

ADDITIONAL TABLES

Table 1. Meta-analyses for expectant care versus surgical management

Outcome	Effect estimate (95% CI)	Participants (trials) ^a	Quality of evidence ^b
Incomplete miscarriage (<= 2 weeks)	RR 3.98 (95% CI 2.94 to 5.38)	1263 (4)	Moderate
Incomplete miscarriage (6 to 8 weeks)	RR 2.56 (95% CI 1.15 to 5.69)	430 (3)	Moderate
Need for additional or un-planned surgery	RR 7.35 (95% CI 5.04 to 10.72)	1454 (5)	Moderate
Pelvic infection by 8 weeks	RR 0.63 (95% CI 0.36 to 1.12)	1514 (7)	High
Bleeding, days	MD 1.59 (95% CI 0.74 to 2.45)	249 (2)	Moderate
Bleeding, needed transfusion	RR 6.45 (95% CI 1.21 to 34.42)	1205 (3)	High

Table 1. Meta-analyses for expectant care versus surgical management (*Continued*)

Participant satisfaction	RR 1.11 (95% CI 0.87 to 1.44)	60 (2)	Low
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^a Number of participants (number of trials)

^b Grades could be high, moderate, low, or very low. RCTs were considered high quality, and downgraded one level for each of the following: outcome subject to bias (assessor not blinded, self-report bias likely); losses > 20% for outcome.

CI: confidence interval; MD: mean difference; RR: risk ratio

Table 2. Single-study analyses for expectant care versus surgical management

Study	Bleeding	Pain	Sick leave	Costs	Psychological	Subsequent pregnancy or live birth
Chipchase 1997	Similar	Similar	Similar			Similar
Karlsen 2001	Worse	Worse				
Nielsen 1995	Similar	Similar	Similar		Similar	
Shelley 2005	Similar	Similar	Similar		Similar (4 measures)	
Trinder 2006	Worse (2 measures)	Worse	Similar	Lower	Similar (2 measures)	Similar
Wieringa-de Waard 2002a	Similar, worse (2 measures)	Similar				
Quality of evidence^a	Moderate	Moderate	Low	High	Moderate	Low

^a Grades could be high, moderate, low, or very low. RCTs were considered high quality: downgraded one level for each of the following: outcome subject to bias (assessor not blinded or self-report bias likely); losses > 20% for outcome.

APPENDICES

Appendix 1. Search strategies for 2012 update

Authors wrote and conducted the following searches:

CENTRAL, The Cochrane Central Library of Controlled Trials (*The Cochrane Library* 2011, Issue 4 of 4)

miscarriage OR “abortion missed” OR “abortion inevitable” OR “abortion spontaneous” OR “abortion incomplete” OR “vacuum curettage” OR “dilation and curettage” in Title, Abstract or Keywords

MEDLINE via PubMed (1 January 2005 to 11 January 2012)

abortion, spontaneous/therapy OR ((abortion, spontaneous OR miscarriage OR abortion, inevitable OR dilation and curettage) AND (maternal health services OR patient care OR expectant therapeutics OR expectant management OR expectant care OR expectant treatment OR conservative management OR conservative treatment))

Limits Activated: Clinical Trial, Randomized Controlled Trial

POPLINE (inception to 11 January 2012)

(spontaneous abortion/miscarriage) & (treatment/management/care)

LILACS (1 January 2005 to 11 January 2012)

ABORTION, SPONTANEOUS or Aborto Espontáneo or ABORTION, MISSED or Aborto Retenido or Aborto Retido or ABORTION, INCOMPLETE or Aborto Incompleto or abortion, inevitable or Dilatation and Curettage or Dilatación y Legrado Uterino or Dilatação e Curetagem or VACUUM CURETTAGE or Legrado por Aspiración or Curetagem a Vácuo [Words] and “CARE” or Atención or Assistência or “MANAGEMENT” or Gerencia or Gerência or “TREATMENT” or Tratamiento or Tratamento [Words]

Appendix 2. Search strategies for the initial review

CENTRAL (2004, Issue 3)

1. miscarriage;
2. abortion missed;
3. abortion inevitable;
4. abortion spontaneous;
5. abortion incomplete;
6. vacuum curettage;
7. dilation and curettage.

MEDLINE via PubMed (inception to March 2005)

abortion, spontaneous/therapy OR (miscarriage OR abortion, inevitable OR dilation and curettage OR vacuum curettage) AND (patient care OR expectant management OR expectant care OR expectant treatment OR conservative management OR conservative treatment)

POPLINE (inception to March 2005)

((abortion spontaneous & (treatment /management/care)) & clinical research

LILACS (1982 to March 2005)

((((("ABORTION, SPONTANEOUS") or "ABORTION, MISSED/") or "ABORTION, INCOMPLETE" or "abortion, inevitable") or "DILATION") or "CURETTAGE") or "VACUUM CURETTAGE" [Words] and (("CARE") or "MANAGEMENT") or "TREATMENT" [Words]))

Appendix 3. Methods, Data collection and analysis, initial review (2006)

The following methods were used to assess included trials in the initial review, published in 2006 ([Chipchase 1997](#); [Karlsen 2001](#); [Nielsen 1995](#); [Thong 2002](#); [Wieringa-de Waard 2002a](#)).

We evaluated the trials using standard criteria without consideration of results ([Alderson 2004](#); [Moher 2001](#)). Two authors independently reviewed all identified trials for inclusion and study quality. Trials without random allocation were excluded without further evaluation. We appraised the trials by examining the following factors: study design, blinding, randomization method, group allocation concealment, exclusions after randomization, loss to follow up and early discontinuation. We resolved discrepancies or disagreements by discussion. For included studies, each author extracted data independently. Data were compared and reconciled data were entered into Review Manager ([RevMan 2003](#)). We calculated the relative risk (RR) for dichotomous outcomes and the weighted mean difference (WMD) for continuous data. For all data, we also computed 95% confidence intervals (CI). We entered additional data such as medians into 'Other data' tables. The data in the present review were generally based on the analytic method used in the trial report (for example, intention to treat or per protocol). Any reasons for exception are given with the results. In the Results, we emphasized the important differences. That is, we included the estimates and CI for the results that were significant ($P < 0.05$). The less important findings are mentioned, and the specific numbers can be found in the tables and figures.

In a subgroup analysis, we intended to examine outcomes for incomplete or inevitable miscarriage (where bleeding has already begun) versus non-viable pregnancy (without bleeding). For the participants having ultrasound examination, we also intended to examine outcomes for embryonic death (less than eight weeks' gestation) versus fetal death (at least eight weeks' gestation). However, we found no studies that reported data separately for non-viable pregnancies documented by ultrasound examination.

For the included studies, we collected information on method of randomization, method of allocation concealment, study setting, details of participants, potential co-interventions (such as bedrest, ultrasound, or antibiotics), power, and completeness of follow-up. Lastly, we collected information on masking of outcome assessment or analysis. If information was lacking in the study reports, we contacted the authors.

WHAT'S NEW

Last assessed as up-to-date: 10 February 2012.

Date	Event	Description
11 January 2012	New citation required and conclusions have changed	Review now includes significant results for the outcomes of 'need for blood transfusion' (Analysis 1.9) and 'cost' (Analysis 1.15). The outcome 'infection' is no longer significant (Analysis 1.5).
11 January 2012	New search has been performed	Search updated. One new trial report identified (Shelley 2005). This has been included. For the trial reports identified from the previous search, we have included one trial (Trinder 2006), excluded one trial (Smith 2006) and identified an additional report of the Wieringa-de Waard 2002a (included study). One study, previously ongoing, has now been excluded (Schwarzler 2003). This review is now comprised of seven trials with 1521 women

HISTORY

Protocol first published: Issue 1, 2002

Review first published: Issue 2, 2006

Date	Event	Description
1 October 2009	Amended	Search updated. Five reports added to Studies awaiting classification (Petrrou 2006; Smith 2006; Smith 2006a; Trinder 2006a; Wieringa-De 2004a)
2 September 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

Kavita Nanda and Alessandra Peggia conceived the idea and registered the title. Kavita Nanda and Alessandra Peggia drafted the review and did the primary data extraction for the initial review. David Grimes wrote parts of the review. Laureen Lopez updated the sources, did the secondary data extraction, and wrote sections of the review. Geeta Nanda edited the review to ensure that psychological and social issues were assessed appropriately. For the 2012 update, Laureen Lopez reviewed the search results, did the primary data extraction, and incorporated the new trials. David Grimes did the secondary data extraction and updated the [Background](#) and [Discussion](#). All authors reviewed the manuscript.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- United States Agency for International Development, USA.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We updated the terminology of miscarriage to explain what the preferred term of 'early pregnancy failure' includes (Background, paragraph 2) . For consistency, we carried that updated terminology through the wording of the objective.

INDEX TERMS

Medical Subject Headings (MeSH)

*Watchful Waiting; Abortion, Incomplete [diagnostic imaging; *surgery]; Abortion, Spontaneous [diagnostic imaging; *surgery]; Anti-Bacterial Agents [therapeutic use]; Bed Rest; Dilatation and Curettage; Pregnancy Trimester, First; Randomized Controlled Trials as Topic; Ultrasonography; Vacuum Curettage

MeSH check words

Female; Humans; Pregnancy