Expectant care versus surgical treatment for miscarriage (Review)

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ABSTRACT

Background
Miscarriage is a common complication of early pregnancy that can have both medical and psychological consequences like 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 loss.

Search strategy
We searched the Cochrane Pregnancy and Childbirth Group Trials Register (December 2005), the Cochrane Central Register of Controlled Trials (*The Cochrane Library* 2004, Issue 3), PubMed (1966 to March 2005), POPLINE (inception to March 2005), and LILACS (1982 to March 2005) and reference lists of reviews.

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

Data collection and analysis
Two authors independently assessed trial quality and extracted data. We contacted study authors for additional information.

Main results
Five trials were included in this review with 689 total participants. The expectant-care group was more likely to have an incomplete miscarriage (RR 5.37; 95% CI 2.57 to 11.22). However, the time frames for declaring the process incomplete varied across the studies. The need for unplanned surgical treatment (such as vacuum aspiration or D&C) was greater for the expectant-care group (RR 4.78; 95% CI 1.99 to 11.48). The expectant-care group had more days of bleeding (WMD 1.59; 95% CI 0.74 to 2.45) and a greater amount of bleeding (WMD 1.00; 95% CI 0.60 to 1.40). Post-procedure diagnosis of infection was lower in the expectant-care group (RR 0.29; 95% CI 0.09 to 0.87). Information on psychological outcomes and pregnancy was too limited to draw conclusions.

Authors' conclusions
Expectant management led to a higher risk of incomplete miscarriage, need for surgical emptying of the uterus, and bleeding. None of these were serious. In contrast, surgical evacuation was associated with a significantly higher risk of infection. Given the lack of clear superiority of either approach, the woman's preference should play a dominant role in decision making. Medical management has added choices for women and their clinicians, but these were not reviewed here.

PLAIN LANGUAGE SUMMARY

Waiting or having surgery for miscarriage

Miscarriage is common in early pregnancy. Such loss can affect physical and mental health. Doctors often suggest surgery such as dilation and curettage (D & C) to complete the process. The goal is to spare the woman bleeding or infection. Expectant management means waiting for the miscarriage to finish on its own. This review looked at whether expectant management worked as well as surgery for miscarriage.

We searched for randomized trials that compared waiting with surgery for miscarriage. In addition, we looked at reference lists to find trials. We also wrote to researchers to find more studies. Five trials with 689 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, and they needed surgery to complete the process. These women also had more bleeding. Women who had surgery to empty the womb more often got an infection. No strong medical results argue for either approach. Information was very limited on mental health or future pregnancy.

Both waiting for the miscarriage to finish and having surgery are appropriate choices. What the woman prefers should be the major concern.

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. Preferred terms for describing the underlying pathologic abnormality, which we use in this review, include anembryonic pregnancy (trophoblast development without development of an embryo); embryonic death (an embryo greater than 5 mm, up to eight weeks' size, with no cardiac activity on ultrasound examination); and fetal death (death after eight weeks). The terms we use 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 (Hutchon 1998; Pridjian 1989). '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.

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. Since the late 1800s, dilation and sharp curettage has been the recommended treatment to reduce potential complications like blood loss and infection (Alloway 1883; Hemminki 1998). This practice has changed little over the past century. Although suction curettage (vacuum aspiration or manual vacuum aspiration) has replaced sharp curettage in many developed countries, it is less common in developing countries due to lack of experience and equipment. In countries where abortion is illegal, or where there is 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 (either anembryonic or without cardiac activity) on early ultrasound.

The natural course of early pregnancy loss is unknown, however, and the need for routine surgical evacuation has been questioned (Ballagh 1998). Surgical evacuation may lead to cervical trauma and subsequent cervical incompetence, uterine perforation, or intrauterine adhesions. Postoperative pelvic infection is another complication. Pelvic ultrasound examination has been suggested as a way to determine the presence or absence of retained tissue and need for further intervention (Haines 1994; Rulin 1993). Medical management of miscarriage with agents such as misoprostol or the progesterone antagonist mifepristone has also been proposed as an alternative to surgical treatment (Chung 1999; Nielsen 1999).

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).

OBJECTIVES

To compare the effectiveness and safety of expectant management versus surgical treatment for early pregnancy loss (anembryonic pregnancy, embryonic demise, fetal demise, incomplete miscarriage, and inevitable miscarriage).

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 (anembryonic pregnancy, embryonic death, and fetal death up to 14 weeks).

Types of intervention

Expectant management excluded any surgical or medical 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 abortions.
(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

See: methods used in reviews.

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

In addition, we searched CENTRAL (*The Cochrane Library* 2004, Issue 3) using the following terms:
(1) miscarriage;
(2) abortion missed;
(3) abortion inevitable;
(4) abortion spontaneous;
(5) abortion incomplete;
(6) vacuum curettage;
(7) dilation and curettage.

We searched PubMed (from inception to March 2005) using the following strategy:

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).

We searched POPLINE (from inception to March 2005) using the following terms:
((abortion spontaneous & (treatment /management/care)) & clinical research

We searched LILACS (1982 to March 2005) using the following strategy:
((((("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])).

We did not apply any language restrictions.

METHODS OF THE REVIEW

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.

DESCRIPTION OF STUDIES

Five trials were identified and considered for inclusion in this review (Chipchase 1997; Karlsen 2001; Nielsen 1995; Thong 2002; Wieringa 2002a). The studies compared expectant care versus surgical management of early pregnancy loss. In two of the studies (Chipchase 1997; Nielsen 1995), women were included if they were in good health with a normal blood count; estimated gestational age was less than 13 weeks; and clinical examination, including transvaginal ultrasound, showed an inevitable or incomplete spontaneous miscarriage with intrauterine tissue having an anterior-posterior diameter of 15 mm to 50 mm (Nielsen 1995) or less than 50 mm (Chipchase 1997). Karlsen 2001 included women with first trimester spontaneous miscarriage. Exclusion criteria were more than 12 weeks since last menses, residual tissue more than 20 mm in diameter in uterus by ultrasound, or women with unacceptable bleeding or pain. Wieringa 2002a included women with diagnosis of early fetal death or incomplete miscarriage at less than 16 weeks. Those excluded were less than 18 years old, those unable to understand the Dutch or English informed consent, or those with severe bleeding, pain, or fever. Thong 2002 included women presenting with first-trimester miscarriage.

Four of the trials reported on successful treatment, retained products of miscarriage, or the need for additional treatment (Karlsen 2001; Nielsen 1995; Thong 2002; Wieringa 2002a). Only Chipchase 1997 did not report on these primary outcomes. All five studies reported the number of women with pelvic infection. All five also reported on bleeding, but the information varied: mean days (Karlsen 2001; Nielsen 1995), median days (Chipchase 1997; Wieringa 2002a), numbers with bleeding that needed transfusion (Thong 2002; Wieringa 2002a), and a scale for bleeding (Karlsen 2001). Four studies reported on pain and the outcomes included means (Nielsen 1995), medians (Chipchase 1997; Wieringa 2002a), and pain scale scores (Karlsen 2001). Two studies provided information on sick leave (Chipchase 1997; Nielsen 1995), and one had results for subsequent pregnancy (Chipchase 1997). Psychosocial measures included participant satisfaction (Chipchase 1997) and anxiety, which was reported in Nielsen 1995.

Observation periods varied across the studies. Karlsen 2001 assessed the women seven to ten days after randomization and/or the procedure. Nielsen 1995 followed the women in both expectant and surgical groups at 3 and 14 days after randomization. Psychological outcomes were assessed right after the 14-day follow-up visit, and were reported in a 1996 report from Nielsen 1995. According to the 1996 report (Nielsen 1996), this smaller group of 86 women were those who spoke Swedish, and they were randomly assigned at 2:1 as per the methods in Nielsen 1995. The measures included an anxiety inventory as well as visual analogue scales regarding the miscarriage experience and concerns about future pregnancies. In a follow up to Nielsen 1995, Blohm reported on pregnancy rates among women attempting conception up to 24 months postrandomization (Blohm 1997). Thong 2002 provided data from about two weeks after randomization, as well as data on complete miscarriages at about seven weeks. Wieringa 2002a reported measures at six weeks after allocation to study arm. Chipchase 1997 did not report when follow up was obtained for the various outcomes, including pregnancy.

METHODOLOGICAL QUALITY

Some of these studies were limited by their sample sizes, with two having fewer than 100 participants (Karlsen 2001; Nielsen 1995). Only Wieringa 2002a addressed sample size or power. The authors had estimated 162 were needed for adequate power, but only 122 of 449 eligible women consented to randomization. The other 305 women had a treatment preference. Other limitations for a meta-analysis were the amount and type of information provided. Some studies provided medians for certain outcomes (Chipchase 1997; Wieringa 2002a), so those results could not be compared with means given in other studies.

The randomization process was not clear in some of the studies and may have been suboptimal. Chipchase 1997 and Thong 2002 did not provide information on the randomization methods. For example, 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. Karlsen 2001 and Nielsen 1995 allocated participants using sealed envelopes, but did not specify whether the envelopes were opaque. Mixing of the envelopes was not specified. Wieringa 2002a reported that the attending physician did the randomization using central electronic randomization, which was stratified for referral setting and gestational age. Therefore, allocation concealment was adequate in one of the studies (Wieringa 2002a) and adequacy was unknown for the other four trials. Given the nature of the intervention, it was not possible to blind the physicians performing the procedures to the method of management. Whether those assessing the clinical outcomes were blind to the group assignment is unknown. Information on days of bleeding and pain came from participants' reports and diaries, which may have varied in consistency.

The studies did not report losses to follow up, but outcomes were reported for all participants in four of the studies. The exception was Karlsen 2001, which excluded three of the original 97 women from the analysis. Some studies reported crossover numbers, as women who had been allocated to the expectant-care group later requested surgical treatment. This included 25 women in Wieringa 2002a and one in Nielsen 1995. These figures do not include those who were determined to need surgical treatment due to complications.

Only Chipchase 1997 reported pregnancies after management, and those data were limited to the women who attempted pregnancy. Blohm 1997 reported follow-up data from the Nielsen 1995 trial. However, information was insufficient to evaluate fertility after the miscarriage.

RESULTS

The review includes data from five trials where expectant care was compared with surgical management in cases of miscarriages. The five trials had a total of 689 participants. Baseline characteristics were compared in Chipchase 1997, Karlsen 2001, Nielsen 1995, and Wieringa 2002a. The comparison groups were similar in the four studies. In Nielsen 1995, 103 participants were randomized to expectant management and 52 to surgical evacuation. In Chipchase 1997, 35 women were eligible and entered the study. Nineteen women were randomized to expectant care and 16 to surgical treatment. In Wieringa 2002a, 122 were randomized, with 64 in the expectant-care group and 58 in the curettage group. Thong 2002 reported that 283 women were randomized, and that 122 women had surgery and 161 had expectant care. This results section emphasizes the significant results ($P < 0.05$) to enhance readability. All of the results can be viewed in the tables and figures.

Incomplete miscarriage

Three studies reported on retained products of conception, incomplete miscarriage, or lack of spontaneous loss (Nielsen 1995; Thong 2002; Wieringa 2002a). The expectant-care group was significantly more likely to have retained products of conception or incomplete miscarriage by the end of the study period. The relative risk (RR) was 5.37 (95% confidence interval (CI) 2.57 to 11.22). However, the observation periods ranged from less than two weeks in Nielsen 1995 and Thong 2002 to six weeks in Wieringa 2002a.

The percentages for complete miscarriage can help in understanding the RR for incomplete miscarriage that was shown above. The figures here are for the individual studies with their time frames. In Nielsen 1995, pregnancy products shown by transvaginal ultrasound examination reportedly disappeared within three days in 79% of the women managed expectantly. According to Thong

2002, complete miscarriage occurred in 81% of the expectant-care group at less than two weeks and 97% in the surgical-treatment group. At seven weeks, the figure for the expectant-management group was 93%. The two-week numbers were used in the calculations, since they were more conservative and more complete across the groups. Wieringa 2002a reported on successful treatment at six weeks. The figures were 47% for spontaneous loss in the expectant-care group and 95% for complete evacuation in the surgical-treatment group. At seven days, 37% of the expectant-care group had a spontaneous completion of the miscarriage.

Clinical need for additional or unplanned surgery

Four studies reported on the need for unplanned surgical treatment (Karlsen 2001; Nielsen 1995; Thong 2002; Wieringa 2002a). The need was significantly greater for women in the expectant-care group when the studies were combined (RR 4.78, 95% CI 1.99 to 11.48). In Karlsen 2001, seven of the 46 women in the observational group had surgical evacuation by ten days. This was generally due to unacceptable pain and/or bleeding. Wieringa 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. In Nielsen 1995, 21 of the 103 expectant-care group needed surgical treatment, in addition to one who had an operation on request. No women in the surgical group required additional operations (Nielsen 1995). Thong 2002 reported surgery was needed for three of the 161 women in the expectant-care group. Consequently, the percentages of women in the expectant-care group needing surgery ranged from 2% to 20%. Within the surgical-treatment group, the percentages needing additional surgery ranged from zero to 5%.

For information, also included is a table with numbers of women who had at least one surgery, according to the reports (Karlsen 2001; Nielsen 1995; Thong 2002; Wieringa 2002a). Included are women who had surgery due to a clinical need and those who requested surgery after randomization. Excluded are women from the surgical-treatment group who had spontaneous loss before the scheduled surgery. Across these four studies, 17% of the expectant-care group had surgery compared to 96% of the surgical-treatment group.

Pelvic infection

Pelvic infection was significantly less frequent in the expectant-care group (RR 0.29, 95% CI 0.09 to 0.87) (Chipchase 1997; Nielsen 1995; Thong 2002). The proportions of participants diagnosed with infection ranged from zero to 10%. The other two trials reported no cases of pelvic infection in either study group (Karlsen 2001; Wieringa 2002a).

Bleeding

The reporting of bleeding complications varied across the studies. Bleeding was reported as mean number of days in Karlsen 2001 and Nielsen 1995. A significant difference in the weighted mean difference (WMD) was evident, with the expectant-care group having more days of bleeding. The WMD for days of bleeding after allocation was 1.59 (95% CI 0.74 to 2.45). The amount of bleeding was significantly greater for the expectant-care group in Karlsen 2001. The WMD for the bleeding scale was 1.00 (95% CI 0.60 to 1.40). Chipchase 1997 and Wieringa 2002a reported bleeding with median numbers of days, so these data could not be combined with the other two studies. Chipchase 1997 also provided the ranges, while Wieringa 2002a gave the 25th and 75th (interquartile) percentiles. Wieringa 2002a reported that the expectant-care group had significantly longer bleeding times than the surgical-treatment group. Chipchase 1997 reported no significant difference. In addition, Wieringa 2002a and Thong 2002 reported no significant difference in the need for blood transfusion. Each study had one woman in the expectant-care group who needed transfusion. The risk of hemorrhage greater than 500 ml was not significantly different in Wieringa 2002a. The expectant-care group had two cases and the surgical-treatment group had one.

Pain

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 WMD was 0.70 (95% CI 0.30 to 1.10).

Costs

While the studies did not report directly on costs, two reported days of sick leave (Chipchase 1997; Nielsen 1995). Nielsen 1995 showed no significant difference in the number of days of sick leave between the two groups. Chipchase 1997 reported median number of days and ranges but noted that the groups did not differ significantly.

Psychosocial outcomes

Psychosocial outcomes were examined in two studies (Chipchase 1997; Nielsen 1995). In Nielsen 1995, there was no difference between the two study arms in the anxiety inventory, as reported in the 1996 paper (Nielsen 1996). However, within the expectant management group, those who had complete miscarriage in three days had a slightly lower anxiety score than those who had surgical treatment due to incomplete miscarriage. The WMD was -5.50 (95% CI -12.73 to 1.73). 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. Chipchase 1997 reported on women's satisfaction with their management, but there was no information on the measure used. Reportedly, all 19 women in the expectant-care group were satisfied with their conservative management, compared to 14 of 16 women with surgical management, due to the delays between diagnosis and operation. The difference was not significant, but the sample was small. In Wieringa 2002a, which used a six-week period to measure success, 25 participants in the expectant-care group (39%) requested surgical treatment. This result is presented here with psychosocial outcomes for it

might indicate reluctance to wait weeks for spontaneous completion.

Other outcomes

There were limited data reported for other outcomes. Wieringa 2002a noted only one case with cervical tear in the expectant-care group and no cases of uterine perforation. Karlsen 2001 reported no peri-operative complications in either group. 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.

Future pregnancies were reported in the Chipchase 1997 study. No significant difference emerged (Chipchase 1997). Nine of 12 women in the expectant-care group and six of the nine women in the surgical-care group who attempted to conceive did so by six months.

DISCUSSION

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 support. Although of limited size and quality, these trials suggest there are no serious medical risks associated with watchful waiting until completion. On the other hand, uterine evacuation led to a significantly higher risk of infection. These findings echo the experience with medical abortion in early pregnancy: if no uterine instrumentation occurs, the risk of infection of the upper genital tract is low (Shannon 2004). 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 1999).

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, since the outcome assessors were unlikely to have been blinded as 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. Again, 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. Nevertheless, only two women needed blood transfusion, although sample sizes were modest. Hemorrhage can occur with miscarriage, and it 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 availability of medical management, for example with misoprostol, has added another important option for women with miscarriage (Blanchard 2004; Graziosi 2004). Women no longer have to choose between an operation and doing nothing. However, this review excluded studies of medical management for miscarriage.

AUTHORS' CONCLUSIONS

Implications for practice

Evidence is insufficient to demonstrate the superiority of either expectant care or surgical treatment. If women can accept a higher rate of incomplete miscarriage with need for later surgical evacuation, and if bleeding is not worrisome, watchful waiting is a reasonable course of action. The policy of routine uterine evacuation lacks scientific support, and this approach paradoxically increases the risk of infection. Given the equivocal evidence, women's preferences should play a large role in management plans.

Implications for research

The studies on which this conclusion is based were underpowered. Further evaluations of expectant management and surgical treatment for incomplete or inevitable miscarriage should be performed in the context of good quality, adequately-powered randomized trials with clearly-defined standardized methods. 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). A three-arm trial comparing expectant management, medical management such as administration of misoprostol, and surgical evacuation might be more relevant to contemporary practice.

POTENTIAL CONFLICT OF INTEREST

None known.

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- No sources of support supplied

REFERENCES

References to studies included in this review

Chipchase 1997 *{published data only}*

Chipchase J, James D. Randomised trial of expectant versus surgical managment of spontaneous miscarriage. *British Journal of Obstetrics and Gynaecology* 1997;**104**:840–1.

Karlsen 2001 *{published data only}*

Karlsen JH, Schiotz HJ. After spontaneous abortion - surgical revision or not?. *Tidsskrift for Den Norske Laegeforening* 2001;**121**:2812–4.

Nielsen 1995 *{published data only}*

Blohm F, Hahlin M, Nielsen S, Milsom I. Fertility after a randomised trial of spontaneous abortion managed by surgical evacuation or expectant treatment [letter]. *Lancet* 1997;**349**:995.

Nielsen S, Hahlin M. Expectant management of first-trimester miscarriage. In: GrundzinkasJG editor(s). *Problems in early pregnancy - advances in diagnosis and managment*. London: Royal College of Obstetricians and Gynaecologists, 1997:265–76.

* Nielsen S, Hahlin M. Expectant management of first-trimester spontaneous abortion. *Lancet* 1995;**345**:84–6.

Nielsen S, Hahlin M, Moller A, Granberg S. Bereavement, grieving and psychological morbidity after first trimester spontaneous abortion: comparing expectant management with surgical evacuation. *Human Reproduction* 1996;**11**(8):1767–70.

Thong 2002 *{published data only}*

Thong KJ, Mahmood TA, Shehata KI. A randomised trial comparing conservative management versus surgical uterine evacuation for first trimester miscarriage with retained products of conception. www.show.scot.nhs.uk/cso/Publications/ExecSumms/Oct_Nov02.htm (accessed 03 March 2005).

Wieringa 2002a *{published data only}*

Wieringa-de Waard M, Vos J, Bonsel G, Bindels P, Ankum W. Management of miscarriage: a randomized controlled trial of expectant management versus surgical evacuation. *Human Reproduction* 2002; **17**:2445–50.

References to studies excluded from this review

Gazvani 2000

Gazvani R, Templeton A. A pilot study for the use of manual vacuum aspiration in early pregnancy loss [abstract]. *Journal of Obstetrics and Gynaecology* 2000;**20**:105.

Gronlund 2002

Gronlund L, Gronlund AL, Clevin L, Anderssen B, Palmgren N, Lidegaard O. Spontaneous abortion: expectant management, medical treatment or surgical evacuation. *Acta Obstetricia et Gynecologica Scandinavica* 2002;**81**:781–2.

Leung 2004

Leung SW, Pang MW, Chung TKH. Retained products of gestation in miscarriage: an evaluation of transvaginal ultrasound criteria for diagnosing an "empty uterus". *American Journal of Obstetrics and Gynecology* 2004;**191**:1133–7.

Ogden 2001

Ogden J. A pragmatic randomised control trial of expectant versus surgical management of first trimester spontaneous miscarriage. National Research Register 2001. http://www.nrr.nhs.uk/ (accessed 25 February 2001).

Shehata 2000

Mahmood TA, Shehata KI, Thong KJ. A randomized study of conservative management versus surgical uterine evacuation for incomplete miscarriage (Interim analysis) [abstract]. XVI FIGO World Congress of Obstetrics & Gynecology; 2000 Sept 3-8; Washington (DC). 2000:68–9.

* Shehata KI, Thong KJ, Mahmood TA. Interim results of a random allocation study of conservative management versus uterine evacuation for incomplete miscarriage [abstract]. *Journal of Obstetrics and Gynaecology* 2000;**20**:105–6.

Ulstrup 1997

Ulstrup KS, Lopez HBB, Mogensen H, Blaakaer J. Treatment of early spontaneous abortion. Evacuation or expectation?. *Acta Obstetricia et Gynecologica Scandinavica* 1997;**76 Suppl**(167:1):78.

Wieringa 2002b

Wieringa-de Waard M, Hartman EE, Ankum WM, Reitsma JB, Bindels PJE, Bonsel GJ. Expectant management versus surgical evacuation in first trimester miscarriage: health-related quality of life in randomized and non-randomized patients. *Human Reproduction* 2002;**17**:1638–42.

Wieringa 2004

Wieringa-de Waard M, Bindels PJE, Vos J, Bonsel GJ, Stalmeier PFM, Ankum WM. Patient preferences for expectant management vs. surgical evacuation in first-trimester uncomplicated miscarriage. *Journal of Clinical Epidemiology* 2004;**57**:167–73.

References to studies awaiting assessment

Shelley 2005

Shelley JM, Healy D, Grover S. A randomised trial of surgical, medical and expectant management of first trimester spontaneous miscarriage. *Australian and New Zealand Journal of Obstetrics and Gynaecology* 2005;**45**:122–7.

References to ongoing studies

Schwarzler 2003

Schwarzler P. The conservative management of first trimester miscarriages and the use of sonography for patients' selection [abstract]. *Ultrasound in Obstetrics and Gynecology* 2003;**22**(Suppl 1):4.

Additional references

Alderson 2004

Alderson P, Green S, Higgins JPT, editors. Cochrane Reviewers' Handbook 4.2.2 [updated March 2004]. In: The Cochrane Library, Issue 1, 2004. Chichester, UK: John Wiley & Sons, Ltd.

Alloway 1883

Alloway TJ. The immediate use of the uterine scoop or curette in the treatment of abortions versus waiting or the expectant plan. *American Journal of Obstetrics and Diseases of Women and Children* 1883;**16**: 133–41.

Ballagh 1998

Ballagh SA, Harris HA, Demasio K. Is curettage needed for uncomplicated incomplete spontaneous abortion?. *American Journal of Obstetrics and Gynecology* 1998;**179**:1279–82.

Blanchard 2004

Blanchard K, Taneepanichskul S, Kiriwat O, Sirimai K, Svirirojana N, Mavimbele N, et al. Two regimens of misoprostol for treatment of incomplete abortion. *Obstetrics & Gynecology* 2004;**103**:860–5.

Blohm 1997

Blohm F, Hahlin M, Nielsen S, Milsom I. Fertility after a randomised trial of spontaneous abortion managed by surgical evacuation or expectant treatment [letter]. *Lancet* 1997;**349**:995.

Cabezas 1998

Cabezas E. Medical versus surgical abortion. *International Journal of Gynecology & Obstetrics* 1998;**63**:S141–S146.

Chung 1999

Chung TK, Lee DT, Cheung LP, Haines CJ, Chang AM. Spontaneous abortion: a randomized, controlled trial comparing surgical evacuation with conservative management using misoprostol [comment in: Fertility and Sterility 2000;73:652]. *Fertility and Sterility* 1999;**71**:1054–9.

Conway 2000

Conway K, Russell G. Couples' grief and experience of support in the aftermath of miscarriage. *British Journal of Medical Psychology* 2000; **73**:531–45.

Geller 2001

Geller PA, Klier CM, Neugebauer R. Anxiety disorders following miscarriage. *Journal of Clinical Psychiatry* 2001;**62**:432–8.

Graziosi 2004

Graziosi GCM, Mol BW, Ankum WM, Bruinse HW. Management of early pregnancy loss. *International Journal of Gynecology & Obstetrics* 2004;**86**:337–46.

Haines 1994

Haines CJ, Chung T, Leung DY. Transvaginal sonography and the conservative management of spontaneous abortion. *Gynecologic and Obstetric Investigation* 1994;**37**:14–7.

Hemminki 1998

Hemminki E. Treatment of miscarriage: current practice and rationale. *Obstetrics & Gynecology* 1998;**91**:247–53.

Hutchon 1998

Hutchon DJ. Understanding miscarriage or insensitive abortion: time for more defined terminology?. *American Journal of Obstetrics and Gynecology* 1998;**179**:397–8.

May 1999

May W, Gülmezoglu AM, Ba-Thike K. Antibiotics for incomplete abortion. *The Cochrane Database of Systematic Reviews* 1999, Issue 4. Art. No.: CD001779. DOI:10.1002/14651858.CD001779.pub2.

Moher 2001

Moher D, Schulz KF, Altman DG, Lepage L. The CONSORT statement: revised recommendations for improving the quality of reports of parallel-group randomised trials. *Lancet* 2001;**357**:1191–4.

Molnar 2000

Molnar AM, Oliver LM, Geyman JP. Patient preferences for management of first-trimester incomplete spontaneous abortion. *Journal of the American Board of Family Practice* 2000;**13**:333–7.

Neugebauer 1997

Neugebauer R, Kline J, Shrout P, Skodol A, O'Connor P, Geller PA, et al. Major depressive disorder in the 6 months after miscarriage. *JAMA* 1997;**277**:383–8.

Nielsen 1996

Nielsen S, Hahlin M, Moller A, Granberg S. Bereavement, grieving and psychological morbidity after first trimester spontaneous abortion: comparing expectant management with surgical evacuation. *Human Reproduction* 1996;**11**(8):1767–70.

Nielsen 1999

Nielsen S, Hahlin M, Platz-Christensen J. Randomised trial comparing expectant with medical management for first trimester miscarriages. *British Journal of Obstetrics and Gynaecology* 1999;**106**:804–7.

Pridjian 1989

Pridjian G, Moawad AH. Missed abortion: still appropriate terminology?. *American Journal of Obstetrics and Gynecology* 1989;**161**: 261–2.

RevMan 2003

The Cochrane Collaboration. Review Manager (RevMan). 4.2 for Windows. Oxford, England: The Cochrane Collaboration, 2003.

Rulin 1993
Rulin MC, Bornstein SG, Campbell JD. The reliability of ultrasonography in the management of spontaneous abortion, clinically thought to be complete: a prospective study. *American Journal of Obstetrics and Gynecology* 1993;**168**:12–5.

Saraiya 1999
Saraiya M, Green CA, Berg CJ, Hopkins FW, Koonin LM, Atrash HK. Spontaneous abortion-related deaths among women in the United States -- 1981-1991. *Obstetrics & Gynecology* 1999;**94**:172–6.

Shannon 2004
Shannon C, Brothers LP, Philip NM, Winikoff B. Infection after medical abortion: a review of the literature. *Contraception* 2004;**70**: 183–90.

Sharma 1993
Sharma JB. Medical management of miscarriage. Psychological impact underestimated. *BMJ* 1993;**306**:1540.

Winikoff 1996
Winikoff B, Ellertson C, Clark S. Analysis of failure in medical abortion. *Contraception* 1996;**54**:323–7.

* *Indicates the major publication for the study*

TABLES

Characteristics of included studies

Study	**Chipchase 1997**
Methods	Randomized controlled trial without blinding. No description of method of randomization or allocation concealment. Women were assessed at one week, two weeks, and six months after inclusion.
Participants	35 women with retained products of conception after spontaneous miscarriage.
Interventions	Expectant care or surgical evacuation.
Outcomes	Number of days of pain, number of days of vaginal bleeding, number of days that normal daily routine was disrupted, time taken for next normal period to occur, any treatment for complications, time taken for the next spontaneous pregnancy and participants' satisfaction.
Notes	Report provided no a priori hypothesis or sample size and power calculation.
Allocation concealment	B – Unclear

Study	**Karlsen 2001**
Methods	Randomized controlled trial without blinding. Groups randomized by choosing a sealed envelope. Women were assessed at 7 to 10 days and were offered another appointment if desired.
Participants	94 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 or surgical evacuation.
Outcomes	Need for (additional) surgical treatment, operative complications, endometritis, number of days of bleeding, amount of bleeding (scale), pain (scale), unscheduled consultation.

Characteristics of included studies (*Continued*)

Notes	Three women excluded (of original 97): one withdrew, one ectopic, and one lost to follow up.
Allocation concealment	B – Unclear

Study	**Nielsen 1995**
Methods	Randomized controlled trial without blinding. Sealed envelopes were withdrawn from a box for allocation at 2:1. 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.
Interventions	Expectant care or surgical treatment.
Outcomes	For 155 women: number of days with pain, number of days with vaginal bleeding, convalescence time, and complications, in particular, pelvic infection. For 86 women: 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.
Notes	The report did not contain an a priori hypothesis or sample size and power calculation.
Allocation concealment	B – Unclear

Study	**Thong 2002**
Methods	Randomized controlled trial without blinding. No description of method of randomization or allocation concealment. 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 versus surgical management (curettage).
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	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	B – Unclear

Study	**Wieringa 2002a**
Methods	Randomized controlled trial without blinding. Randomized by attending physician using central electronic randomization; stratified for referral setting and gestational age. 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 or suction curettage.
Outcomes	Excessive bleeding (> 500 ml), genital infection, cervical tear, uterine perforation, intrauterine synechiae, completion of miscarriage within 6 weeks (for expectant group) or no need for repeat curettage within 6 weeks (for surgical group), emergency curettage, self-reported days of bleeding and pain.
Notes	Sample size to detect a difference of 20% in efficacy with 80% power; no alpha mentioned; had 162 total. However, only 122 of 427 eligible women agreed to be randomized. 305 women expressed preference for

	treatment and were included in observational arm of study. Primary analysis was intention-to- treat. Also compared outcomes among observational group.
Allocation concealment	A – Adequate

Characteristics of excluded studies

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 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	Studied 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.
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 report, 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.
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.
Wieringa 2002b	Related to Wieringa 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 2004	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

Characteristics of ongoing studies

Study	Schwarzler 2003
Trial name or title	Conservative management of first trimester miscarriage and the use of sonography for participant's selection.
Participants	104 women.
Interventions	Randomized to D&C (N = 48); conservative management (N = 56).
Outcomes	Comparative data (from D&C) not available from abstract
Starting date	Not available.
Contact information	Peter.Schwarzler@uibk.ac.at
Notes	Researcher was going to write up the report (2004).

D&C: dilation and curettage

ANALYSES

Comparison 01. Expectant care versus surgical treatment for miscarriage

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Miscarriage not complete (up to 6 weeks)	3	560	Relative Risk (Fixed) 95% CI	5.37 [2.57, 11.22]
02 Needed (additional) surgical evacuation	4	654	Relative Risk (Fixed) 95% CI	4.78 [1.99, 11.48]
03 Had surgery (clinical need or woman's preference)	5	689	Relative Risk (Fixed) 95% CI	0.18 [0.14, 0.23]
04 Localized pelvic infection	5	689	Relative Risk (Fixed) 95% CI	0.29 [0.09, 0.87]
05 Endometritis	1	94	Relative Risk (Fixed) 95% CI	Not estimable
06 Mean (standard deviation) days of pain	1	155	Weighted Mean Difference (Fixed) 95% CI	0.23 [-0.26, 0.72]
07 Pain (scale 0 to 3)	1	94	Weighted Mean Difference (Fixed) 95% CI	0.70 [0.30, 1.10]
08 Mean (standard deviation) days of bleeding	2	249	Weighted Mean Difference (Fixed) 95% CI	1.59 [0.74, 2.45]
09 Bleeding with need for transfusion	2	405	Relative Risk (Fixed) 95% CI	2.49 [0.26, 23.66]
10 Hemorrhage > 500 ml	1	122	Relative Risk (Fixed) 95% CI	1.81 [0.17, 19.47]
11 Bleeding (scale 1 to 3)	1	94	Weighted Mean Difference (Fixed) 95% CI	1.00 [0.60, 1.40]
12 Cervical tear	1	122	Relative Risk (Fixed) 95% CI	2.72 [0.11, 65.56]
13 Perioperative complications	1	94	Relative Risk (Fixed) 95% CI	Not estimable
14 Participant satisfaction with management	1	35	Relative Risk (Fixed) 95% CI	1.14 [0.95, 1.38]
15 State anxiety inventory	1	86	Weighted Mean Difference (Fixed) 95% CI	0.00 [-6.09, 6.09]
16 State anxiety inventory within expectant care group	1	58	Weighted Mean Difference (Fixed) 95% CI	-5.50 [-12.73, 1.73]
17 Days of sick leave after management of miscarriage	1	155	Weighted Mean Difference (Fixed) 95% CI	-0.19 [-1.54, 1.16]
18 Subsequent conception	1	21	Relative Risk (Fixed) 95% CI	1.13 [0.64, 1.98]
19 Days of pain reported as medians			Other data	No numeric data
20 Days of bleeding reported as medians			Other data	No numeric data
21 Days of sick leave reported as medians			Other data	No numeric data

INDEX TERMS

Medical Subject Headings (MeSH)

Abortion, Incomplete [surgery; ultrasonography]; Abortion, Spontaneous [*surgery; ultrasonography]; Anti-Bacterial Agents [therapeutic use]; Bed Rest; Dilatation and Curettage; Pregnancy Trimester, First; Randomized Controlled Trials; Vacuum Curettage

MeSH check words

Female; Humans; Pregnancy

COVER SHEET

Title Expectant care versus surgical treatment for miscarriage

Authors	Nanda K, Peloggia A, Grimes D, Lopez L, Nanda G
Contribution of author(s)	Kavita Nanda and Alessandra Peloggia conceived the idea and registered the title. Kavita Nanda and Alessandra Peloggia drafted the review and did the primary data extraction. 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.
Issue protocol first published	2002/1
Review first published	2006/2
Date of most recent amendment	21 February 2006
Date of most recent SUBSTANTIVE amendment	17 February 2006
What's New	Information not supplied by author
Date new studies sought but none found	Information not supplied by author
Date new studies found but not yet included/excluded	30 December 2005
Date new studies found and included/excluded	Information not supplied by author
Date authors' conclusions section amended	Information not supplied by author
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DOI	10.1002/14651858.CD003518.pub2
Cochrane Library number	CD003518
Editorial group	Cochrane Pregnancy and Childbirth Group
Editorial group code	HM-PREG

GRAPHS AND OTHER TABLES

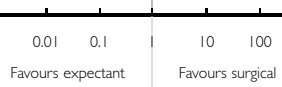
Analysis 01.01. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 01 Miscarriage not complete (up to 6 weeks)

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 01 Miscarriage not complete (up to 6 weeks)

Study	Expectant n/N	Surgical n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
Nielsen 1995	21/103	1/52		14.7	10.60 [1.47, 76.65]
Thong 2002	30/161	4/122		50.4	5.68 [2.06, 15.70]
Wieringa 2002a	9/64	3/58		34.9	2.72 [0.77, 9.56]
Total (95% CI)	328	232		100.0	5.37 [2.57, 11.22]
Total events: 60 (Expectant), 8 (Surgical)					
Test for heterogeneity chi-square=1.59 df=2 p=0.45 I² =0.0%					
Test for overall effect z=4.48 p<0.00001					



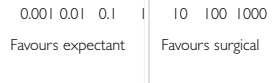
Analysis 01.02. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 02 Needed (additional) surgical evacuation

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 02 Needed (additional) surgical evacuation

Study	Expectant n/N	Surgical n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
Karlsen 2001	7/46	0/48		7.4	15.64 [0.92, 266.22]
Nielsen 1995	21/103	0/52		10.1	21.91 [1.35, 354.74]
Thong 2002	3/161	2/122		34.6	1.14 [0.19, 6.70]
Wieringa 2002a	7/64	3/58		47.9	2.11 [0.57, 7.80]
Total (95% CI)	374	280		100.0	4.78 [1.99, 11.48]
Total events: 38 (Expectant), 5 (Surgical)					
Test for heterogeneity chi-square=5.84 df=3 p=0.12 I² =48.6%					
Test for overall effect z=3.50 p=0.0005					



Analysis 01.03. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 03 Had surgery (clinical need or woman's preference)

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

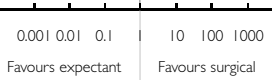
Outcome: 03 Had surgery (clinical need or woman's preference)

Study	Expectant n/N	Surgical n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
× Chipchase 1997	19/19	16/16		0.0	Not estimable
Karlsen 2001	7/46	48/48		15.4	0.15 [0.08, 0.30]
Nielsen 1995	22/103	52/52		22.6	0.21 [0.15, 0.31]
Thong 2002	3/161	122/122		45.5	0.02 [0.01, 0.06]
Wieringa 2002a	32/64	48/58		16.5	0.60 [0.46, 0.79]
Total (95% CI)	393	296		100.0	0.18 [0.14, 0.23]

Total events: 83 (Expectant), 286 (Surgical)

Test for heterogeneity chi-square=93.13 df=3 p=<0.0001 I^2 =96.8%

Test for overall effect z=14.84 p<0.00001



Analysis 01.04. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 04 Localized pelvic infection

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

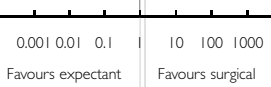
Outcome: 04 Localized pelvic infection

Study	Expectant n/N	Surgical n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
Chipchase 1997	1/19	1/16		9.3	0.84 [0.06, 12.42]
× Karlsen 2001	0/46	0/48		0.0	Not estimable
Nielsen 1995	3/103	5/52		56.7	0.30 [0.08, 1.22]
Thong 2002	0/161	3/122		34.0	0.11 [0.01, 2.08]
× Wieringa 2002a	0/64	0/58		0.0	Not estimable
Total (95% CI)	393	296		100.0	0.29 [0.09, 0.87]

Total events: 4 (Expectant), 9 (Surgical)

Test for heterogeneity chi-square=1.04 df=2 p=0.60 I^2 =0.0%

Test for overall effect z=2.21 p=0.03



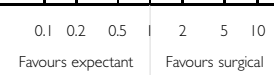
Analysis 01.05. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 05 Endometritis

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 05 Endometritis

Study	Expectant n/N	Surgical n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
× Karlsen 2001	0/48	0/46		0.0	Not estimable
Total (95% CI)	48	46		0.0	Not estimable
Total events: 0 (Expectant), 0 (Surgical)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					



Analysis 01.06. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 06 Mean (standard deviation) days of pain

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 06 Mean (standard deviation) days of pain

Study	Expectant N	Mean(SD)	Surgical N	Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Nielsen 1995	103	1.92 (1.47)	52	1.69 (1.46)		100.0	0.23 [-0.26, 0.72]
Total (95% CI)	103		52			100.0	0.23 [-0.26, 0.72]
Test for heterogeneity: not applicable							
Test for overall effect z=0.92 p=0.4							

Analysis 01.07. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 07 Pain (scale 0 to 3)

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 07 Pain (scale 0 to 3)

Study	Expectant		Surgical		Weighted Mean Difference (Fixed)	Weight	Weighted Mean Difference (Fixed)
	N	Mean(SD)	N	Mean(SD)	95% CI	(%)	95% CI
Karlsen 2001	46	1.40 (1.13)	48	0.70 (0.79)		100.0	0.70 [0.30, 1.10]
Total (95% CI)	46		48			100.0	0.70 [0.30, 1.10]
Test for heterogeneity: not applicable							
Test for overall effect z=3.47 p=0.0005							

Analysis 01.08. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 08 Mean (standard deviation) days of bleeding

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 08 Mean (standard deviation) days of bleeding

Study	Expectant		Surgical		Weighted Mean Difference (Fixed)	Weight	Weighted Mean Difference (Fixed)
	N	Mean(SD)	N	Mean(SD)	95% CI	(%)	95% CI
Karlsen 2001	46	7.20 (4.72)	48	4.80 (2.77)		29.4	2.40 [0.83, 3.97]
Nielsen 1995	103	8.79 (3.01)	52	7.53 (3.06)		70.6	1.26 [0.25, 2.27]
Total (95% CI)	149		100			100.0	1.59 [0.74, 2.45]
Test for heterogeneity chi-square=1.42 df=1 p=0.23 I^2 =29.8%							
Test for overall effect z=3.67 p=0.0002							

Analysis 01.09. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 09 Bleeding with need for transfusion

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 09 Bleeding with need for transfusion

Study	Expectant n/N	Surgical n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
Thong 2002	1/161	0/122		52.0	2.28 [0.09, 55.44]
Wieringa 2002a	1/64	0/58		48.0	2.72 [0.11, 65.56]
Total (95% CI)	225	180		100.0	2.49 [0.26, 23.66]

Total events: 2 (Expectant), 0 (Surgical)

Test for heterogeneity chi-square=0.01 df=1 p=0.94 I^2 =0.0%

Test for overall effect z=0.79 p=0.4

Analysis 01.10. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 10 Hemorrhage > 500 ml

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 10 Hemorrhage > 500 ml

Study	Expectant n/N	Surgical n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
Wieringa 2002a	2/64	1/58		100.0	1.81 [0.17, 19.47]
Total (95% CI)	64	58		100.0	1.81 [0.17, 19.47]

Total events: 2 (Expectant), 1 (Surgical)

Test for heterogeneity: not applicable

Test for overall effect z=0.49 p=0.6

Analysis 01.11. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 11 Bleeding (scale 1 to 3)

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 11 Bleeding (scale 1 to 3)

Study	Expectant		Surgical		Weighted Mean Difference (Fixed)	Weight	Weighted Mean Difference (Fixed)
	N	Mean(SD)	N	Mean(SD)	95% CI	(%)	95% CI
Karlsen 2001	46	2.30 (0.61)	48	1.30 (1.28)		100.0	1.00 [0.60, 1.40]
Total (95% CI)	46		48			100.0	1.00 [0.60, 1.40]
Test for heterogeneity: not applicable							
Test for overall effect z=4.87 p<0.00001							

Analysis 01.12. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 12 Cervical tear

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 12 Cervical tear

Study	Expectant	Surgical	Relative Risk (Fixed)	Weight	Relative Risk (Fixed)
	n/N	n/N	95% CI	(%)	95% CI
Wieringa 2002a	1/64	0/58		100.0	2.72 [0.11, 65.56]
Total (95% CI)	64	58		100.0	2.72 [0.11, 65.56]
Total events: 1 (Expectant), 0 (Surgical)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.62 p=0.5					

Analysis 01.13. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 13 Perioperative complications

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 13 Perioperative complications

Study	Expectant n/N	Surgical n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
× Karlsen 2001	0/46	0/48		0.0	Not estimable
Total (95% CI)	46	48		0.0	Not estimable
Total events: 0 (Expectant), 0 (Surgical)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

Analysis 01.14. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 14 Participant satisfaction with management

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 14 Participant satisfaction with management

Study	Expectant n/N	Surgical n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
Chipchase 1997	19/19	14/16		100.0	1.14 [0.95, 1.38]
Total (95% CI)	19	16		100.0	1.14 [0.95, 1.38]
Total events: 19 (Expectant), 14 (Surgical)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.41 p=0.2					

Analysis 01.15. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 15 State anxiety inventory

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 15 State anxiety inventory

Study	Expectant N	Expectant Mean(SD)	Surgical N	Surgical Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Nielsen 1995	58	57.50 (12.40)	28	57.50 (14.00)		100.0	0.00 [-6.09, 6.09]
Total (95% CI)	58		28			100.0	0.00 [-6.09, 6.09]
Test for heterogeneity: not applicable							
Test for overall effect z=0.00 p=1							

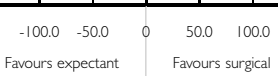
Analysis 01.16. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 16 State anxiety inventory within expectant care group

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 16 State anxiety inventory within expectant care group

Study	Expectant N	Expectant Mean(SD)	Surgical N	Surgical Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Nielsen 1995	43	56.10 (12.30)	15	61.60 (12.30)		100.0	-5.50 [-12.73, 1.73]
Total (95% CI)	43		15			100.0	-5.50 [-12.73, 1.73]
Test for heterogeneity: not applicable							
Test for overall effect z=1.49 p=0.1							



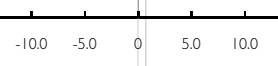
Analysis 01.17. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 17 Days of sick leave after management of miscarriage

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 17 Days of sick leave after management of miscarriage

Study	Expectant N	Expectant Mean(SD)	Surgical N	Surgical Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Nielsen 1995	103	2.65 (2.90)	52	2.84 (4.52)		100.0	-0.19 [-1.54, 1.16]
Total (95% CI)	103		52			100.0	-0.19 [-1.54, 1.16]
Test for heterogeneity: not applicable							
Test for overall effect z=0.28 p=0.8							

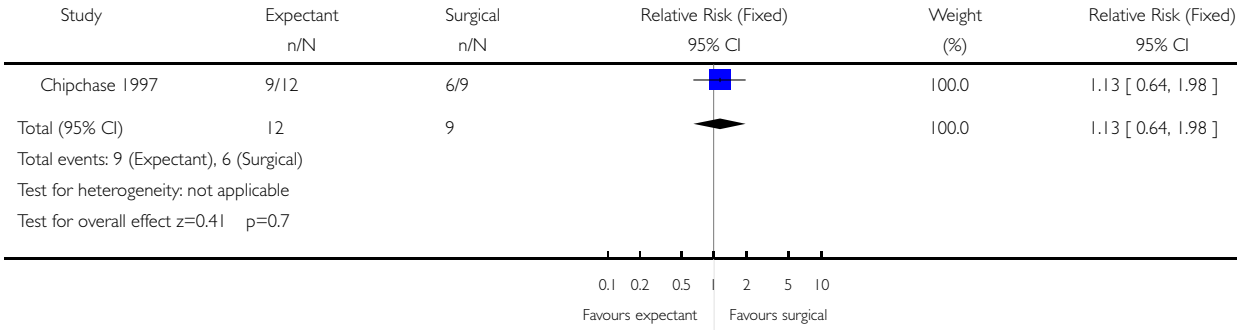


Analysis 01.18. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 18 Subsequent conception

Review: Expectant care versus surgical treatment for miscarriage

Comparison: 01 Expectant care versus surgical treatment for miscarriage

Outcome: 18 Subsequent conception



Analysis 01.19. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 19 Days of pain reported as medians

Days of pain reported as medians

Study	Study group	Median days	Range or percentiles
Chipchase 1997	Expectant care	0	Range: 0 to 5
Chipchase 1997	Surgical treatment	0	Range: 0 to 2
Wieringa 2002a	Expectant care	14	25th and 75th percentiles: 7 and 24
Wieringa 2002a	Surgical treatment	11	25th and 75th percentiles: 6 and 26

Analysis 01.20. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 20 Days of bleeding reported as medians

Days of bleeding reported as medians

Study	Study group	Median days	Range or percentiles
Chipchase 1997	Expectant care	4	Range: 0 to 7
Chipchase 1997	Surgical treatment	2	Range: 0 to 7
Wieringa 2002a	Expectant care	17	25th and 75th percentiles: 10 and 26
Wieringa 2002a	Surgical treatment	13	25th and 75th percentiles: 9 and 17

Analysis 01.21. Comparison 01 Expectant care versus surgical treatment for miscarriage, Outcome 21 Days of sick leave reported as medians

Days of sick leave reported as medians

Study	Study group	Median days	Range or percentiles
Chipchase 1997	Expectant care	4	Range: 0 to 28
Chipchase 1997	Surgical treatment	6.5	Range: 0 to 7