Mechanical methods for induction of labour

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Induction of labour using mechanical methods results in similar caesarean section rates as prostaglandins, but with a lower risk of hyperstimulation. In women with an unfavourable cervix, prior cervical ripening with a mechanical device seems to be more effective than induction with oxytocin.

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1. INTRODUCTION

Induction of labour is a common procedure in obstetrics (1, 2), and is defined as the initiation of labour by artificial means prior to its spontaneous onset at a viable gestational age, with the aim of achieving vaginal delivery in a pregnant woman with intact membranes. In developed countries, induction of labour accounts for about 25% of all deliveries. In developing countries, the rates vary; lower in some regions, and high in some areas (3). African countries generally have lower induction rates compared with Latin American and Asian countries (3). A study by the WHO Global Survey on Maternal and Perinatal Health in 24 countries reported that induction of labour accounted for 9.6% of all deliveries (3). The incidence of labour induction was also noted to be on the increase (3).

Mechanical methods are among the oldest and most important approaches used for induction of labour (4, 5). They are indicated for labour induction in prolonged pregnancies, diabetic and hypertensive disorders of pregnancy and premature rupture of membranes. Despite these advantages, adverse effects like fetal distress, uterine rupture, uterine hyperstimulation, failed induction of labour and caesarean sections could occur following labour induction. Others include membrane rupture, bleeding, placental disruption, and frequent need for oxytocin for labour induction, with its accompanying adverse effects (6).

Methods for induction of labour can be mechanical or pharmacological. Mechanical means of labour induction include the use various type of catheters and hygroscopic dilators, introduced into the cervical canal or into the extra-amniotic space (7). In obstetric practice the preferred method often depends on the experience of the practitioner and availability and requirements of the method.

Mechanical modalities exert local pressure onto the cervix, overstretching the lower uterine segment and indirectly stimulating the secretion of prostaglandins (8). Balloon catheters provide direct pressure on the cervix as the balloon is filled, while hygroscopic dilators absorb cervical and local tissue fluids, causing the device to expand within the cervical canal, providing controlled mechanical pressure (5). This Cochrane (9) review aimed to compare the effects of mechanical methods for third-trimester cervical ripening or induction of labour with placebo/no treatment, prostaglandins and oxytocin.

2. METHODS OF THE REVIEW
The review authors used appropriate, standard Cochrane methodology, including a comprehensive search for trials, inclusion of trials according to predefined quality criteria, transparent data extraction and pre-specified analyses.

The outcome measures included vaginal delivery not achieved within 24 hours, uterine hyperstimulation with fetal heart rate (FHR) changes, caesarean section, neonatal and maternal morbidity and mortality and adverse effects of induction of labour. This review updates and replaces the earlier version written by Boulvain et al. (7). The main differences in this update include the addition of: (i) comparisons of balloon catheter with concurrent oxytocin or prostaglandins versus prostaglandins; (ii) comparisons of extra-amniotic infusion with and without concurrent oxytocin versus prostaglandins; (iii) a number of not pre-specified outcomes relevant to the comparisons made in this review (maternal fever, antibiotics during labour, endometritis, chorioamnionitis).

3. RESULTS OF THE REVIEW

The systematic review included a total of 71 randomized controlled trials (RCTs), involving 9722 women that met the reviewers’ inclusion criteria. A large number of studies were identified. However, most studies had small sample sizes and had compared various mechanical methods with different control interventions.

3.1 Any mechanical method versus no treatment

Only one study comprising of 48 women reported on women who did not achieve vaginal delivery in 24 hours. The number of vaginal deliveries not achieved in 24 hours was 69% with mechanical methods versus 77% with no treatment [relative risk (RR) 0.90, 95% confidence interval (CI) 0.64–1.26]. The risk of caesarean section (6 studies, 416 women) was similar between both groups (34%; RR 1.00, 95% CI 0.76–1.30).

3.2 Any mechanical method versus intra-vaginal prostaglandins

Three trials involving 586 women reported on not achieving vaginal delivery in 24 hours. The number of vaginal deliveries not achieved in 24 hours was 29% versus 7% (RR 4.38, 95% CI 1.74–10.98). Mechanical methods were shown to reduce the risk of hyperstimulation with fetal heart rate changes when compared with vaginal prostaglandins (0% versus 5%; RR 0.16, 95% CI 0.06–0.39).

3.3 Any mechanical method versus intra-cervical prostaglandins

Two trials involving 200 women reported on not achieving vaginal delivery in 24 hours. The number of vaginal deliveries not achieved in 24 hours had conflicting results (RR 0.58, 95% CI 0.34–0.99 and RR 1.70, 95% CI 1.15–2.51). Mechanical methods reduced the risk of hyperstimulation with fetal heart rate changes when compared with intracervical prostaglandins, but this was not statistically significant (0% versus 1%; RR 0.21, 95% CI: 0.04–1.20).

3.4 Any mechanical method versus vaginal misoprostol

Four trials involving 594 women reported on not achieving vaginal delivery in 24 hours. The effectiveness of mechanical methods was similar (38% versus 33%; RR 1.17, 95% CI 0.94–1.44). Mechanical methods reduced the risk of hyperstimulation with fetal heart rate changes when compared with misoprostol (2% versus 7%; RR 0.35; 95% CI 0.24–0.53).

3.5 Any mechanical method versus oral misoprostol

Only one study involving 151 women had compared mechanical methods with oral misoprostol. The risk of
caesarean section was similar between the groups (14% versus 12%; RR 1.14, 95% CI 0.50–2.60). The effectiveness of mechanical methods was similar (34% versus 30%; RR 1.15, 95% CI 0.80–1.66).

3.6 Any mechanical method versus oxytocin

Mechanical methods had lower risk of caesarean section (5 trials; 398 women; 17% versus 28%; RR 0.62, 95% CI 0.42–0.90). Mechanical methods did not reduce the risk of hyperstimulation with fetal heart rate changes when compared with vaginal prostaglandins (0% versus 2%; RR 0.20, 95% CI 0.01–4.11).

4. DISCUSSION

4.1. Applicability of the results

The authors concluded that there is insufficient evidence to evaluate the effectiveness, in terms of likelihood of vaginal delivery in 24 hours or caesarean section of mechanical methods compared with no treatment or with prostaglandins. However, induction of labour using mechanical methods results in similar caesarean section rates as prostaglandins, but with a lower risk of hyperstimulation. They also noted that it is unlikely that there is no beneficial effect on the likelihood of vaginal delivery within 24 hours when using mechanical methods in comparison with no treatment as indirect evidence in view of the comparison with prostaglandins. In women with an unfavourable cervix, the review found that prior cervical ripening with a mechanical device seems to be more effective than induction with oxytocin. Hence, from the results of this review, mechanical methods are recommended for induction of labour with some caution.

As a number of the trials reviewed were conducted in developing countries, the results are applicable to practice in under-resourced settings. According to the limited data available, there is no evidence of an increased risk of maternal or neonatal morbidity with mechanical methods. However, the authors noted that the data should be interpreted cautiously.

4.2 Implementation of the intervention

Mechanical methods, from a cost–effective standpoint, should be preferred in under-resourced settings because of lower cost compared to pharmacological methods, simplicity of storage and preservation of mechanical devices, and reduction of side-effects compared with pharmacological methods. Mechanical methods are also widely available in under-resourced settings, especially the Foley catheters.

One of the challenges in under-resourced settings as regards induction of labour is grand multiparity (5). Women that go into high parity in resource limited settings present unique challenges for induction of labour. In these women induction of labour is best managed in facilities equipped with devices for continuous fetal monitoring. Mechanical methods are preferred in these women because pharmacological methods may easily be complicated by rupture of the uterus or fetal distress or they may lead to precipitate labour (5).

Induction of labour can also be challenging in nulliparous women (10). This is partly because the cervix is usually unfavourable in nulliparous women, making it difficult to insert mechanical methods. In nulliparous women with an unfavourable cervix, cervical ripening seems to be more effective prior to induction of labour with mechanical methods.

The commonest mechanical method used in under-resourced settings is the balloon catheter, and this has been found to be effective in cervical ripening and subsequent induction of labour. Balloon catheters may be preferred for women with scarred uterus, since this Cochrane review showed that it is less likely to be associated with hyperstimulation of the uterus. During induction of labour, women require very close fetal monitoring to avoid potential risks associated with the procedure. This can strain the limited health-care resources in under-resourced settings, and may not always feasible. To avoid this, health services should
implement a strategy to improve the quality of care for pregnant women undergoing induction of labour, including early detection and appropriate management of complications.

4.3 Implications for research

The authors of the review identified important knowledge gaps that need to be addressed through primary research. Overall, it was noted that further studies on mechanical methods involving large sample sizes should be considered a priority to obtain more reliable evidence. Cost–effectiveness analytic methods comparing mechanical methods with prostaglandins for cervical ripening are other areas of research, especially in under-resourced settings. Additional research comparing the balloon catheter use with placebo is needed to consolidate the recommendation on induction of labour using balloon catheters.

References


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