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Cervical ripening and induction of labour: Inpatient or outpatient, oral misoprostol or Foley catheter?

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Induction of labour by mammary stimulation and mechanical dilation of the cervical canal, and by artificial rupture of membranes (amniotomy), have evidently been described by Hippocrates (circa 400 BC) and Soranus (circa AD 103) respectively [1]. In 1909, Bell described the use of an extract from the pituitary for induction of labour, but it had serious side effects including rupture of the uterus [2]. After Vincent du Vigneaud synthesized oxytocin in 1954, the intra venous infusion of synthetic oxytocin, mostly in combination with amniotomy, became the preferred method for induction of labour [3]. Embrey and Mollison, in 1967, described the supra cervical placement of a Foley catheter for ripening of the cervix to make it favourable for induction of labour while Karim et al introduced the use of prostaglandins for induction of labour in 1968 [4,5]. The original indication for induction of labour was to deliver a dead fetus but currently it is carried out when delivering the baby rather than continuing the pregnancy is considered beneficial for the baby and or the mother, (eg. post term pregnancy, pre-labour rupture of membranes, hypertension in pregnancy, hyperglycaemia in pregnancy, mild to moderate fetal growth restriction and oligohydramnios). Although not recommended, sometimes induction of labour is also carried out for social reasons such as the convenience of not only the mother and her partner but even the attending obstetrician. When embarking on induction of labour, it is essential to review the indication carefully, discuss all the pros and cons of induction of labour with the woman and her partner, and keep in mind the foremost ethical principal of 'do no harm' and avoid fetal or neonatal compromise as well as maternal morbidity, especially caesarean delivery, due to failed induction of labour. Currently, a low dose of oral misoprostol, a synthetic methyl analogue of prostaglandin E1, has come to the forefront as a method for induction of labour. There is a concerted effort to identify the most convenient and cost effective method of cervical ripening and induction of labour, which could be safely adopted even in an outpatient setting [6-17].



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Ripening of cervix and induction of labour

Spontaneous onset of labour is preceded by structural remodeling or 'ripening' of the cervix which is thought to be primarily brought about by interaction of nitric oxide (NO) with numerous cytokines and free radicals [18,19]. This is followed by interlinked, harmonized changes in the levels of estrogen, progesterone, prostaglandins, corticotrophin releasing hormone and cortisol as well as their receptors, which lead to the initiation of labour [19]. However, there is no clear demarcation between ripening of the cervix and the onset of labour, with the former merging in to the latter in one continuous process. Most of the agents used for ripening of the cervix lead to induction of labour if used in higher concentration, more frequently or for longer durations. Therefore, it has been suggested that cervical ripening and induction of labour should not be studied as separate entities [6,20]. However, an ideal cervical ripening agent may cause structural remodelling of the cervix, making it softer, shorter and partially dilated and favourable for future induction of labour with another method, without stimulating uterine contractions. Vaginally administered NO donors eg. isosorbide mononitrate have been shown to be effective for this purpose [21-23].

Low dose oral misoprostol

Low dose oral misoprostol is safer than vaginal misoprostol with less risks of hyperstimulation, caesarean delivery, delivery of babies with Apgar <7, and post partum haemorrhage. It is more effective than amniotomy with intravenous oxytocin which can result in increased caesarean delivery, especially if the cervix is 'not ripe' [6-9]. Doses ranging from 20- 200µg, with frequencies varying from hourly to six hourly and the administration of up to 12 doses of 50 µg over four days have been reported. A starting dose of 20 µg of oral misoprostol in solution, titrated against uterine contractions and administered hourly in increasing doses of up to 60 µg, is currently thought to be a safe, cost effective method for induction of labour [6-10]. The hourly dosing regimen has been calculated according to the pharmacokinetics of oral misoprostol. Its half-life as well as the time taken to achieve peak serum concentrations vary from approximately 20-40 minutes [9,24]. Although, doses of 20, 40 and 60µg of oral misoprostol are easily prepared by dissolving the commonly available 200µg tablet in 200ml of water, if 25µg tablets are available they too could be used and a more practical regimen of 50µg administered four hourly, could be implemented [7,10]. This would be useful in settings with a heavy work load which lack facilities for one to one nursing care and intensive fetal monitoring. The induction delivery interval possibly being slightly longer after low dose oral misoprostol should not be considered as a major drawback. The fact that it is safer than vaginal misoprostol, results in less caesarean delivery and is also effective with an 'unripe' cervix in contrast to amniotomy and intra venous infusions, indicate that it

should be the preferred method for induction of labour now [6-10]. The increased occurrence of meconium stained liquor, without any associated evidence of neonatal asphyxia (risk of Apgar <7 is reduced with oral misoprostol) suggests that the passage of meconium could be due to stimulation of the fetal gut by oral misoprostol [7]. However, the maternal and fetal well-being need to be closely monitored when administering low dose oral misoprostol.

Supra cervical Foley catheter

Although less effective than oral and vaginal misoprostol, vaginal dinoprostone, and amniotomy with oxytocin infusion, the placement of a supra cervical Foley catheter has the advantage of not increasing the risk of hyperstimulation [6,8]. The use of a larger volume of fluid (60-80ml) in the bulb of the Foley catheter is recommended as this is associated with increased vaginal delivery in 24 hours. However, no significant differences in caesarean delivery rates have been observed [25]. Although the Foley catheter is often removed after 24 hours due to concerns about possible ascending infections, there does not appear to be a significant increase of chorioamnionitis associated with the insertion of a Foley catheter for induction of labour. Keeping the Foley catheter up to three to four days is safe and effective for induction of labour [8,10,26,27]. However, the Foley catheter should not be inserted in the presence of overt vaginal or cervical infection, and appropriate antiseptic measures and sterile procedures should be adopted during its insertion. The urinary channel of the Foley catheter should be closed off with a sterile cap and the catheter should be taped to the woman's thigh, applying gentle traction.

Combined methods

The combination of a Foley catheter with low dose vaginal misoprostol has been shown to be more effective, with shorter induction delivery interval than the combination of a Foley catheter with intravenous oxytocin infusion, a Foley catheter alone or oral misoprostol alone for induction of labour [28]. However, the combination of a Foley catheter with vaginal misoprostol could lead to an increased risk of chorioamnionitis, probably due to the increased number of vaginal examinations involved with the administration of vaginal misoprostol [29]. The combination of a Foley catheter with low dose oral misoprostol is reported to be more effective and has shorter induction delivery interval than vaginal misoprostol [30]. The combination of amniotomy and intravenous oxytocin infusions are effective in increasing rates of vaginal delivery in 24 hours in women having 'ripe' cervixes, favourable for induction of labour [31]. When considering all available evidence, the combination of a Foley catheter with low dose oral misoprostol appears to be the best combination for induction of labour irrespective of cervical favourability.

Outpatient ripening of cervix and induction of labour

Vaginally administered NO donors, such as isosorbide mononitrate, are effective and can be safely used for outpatient cervical ripening after 40 weeks' gestation in low risk women, although they may be ineffective prior to 40 weeks' gestation [23, 32]. As it does not need intensive maternal or fetal monitoring, and is safe and effective for induction of labour if kept in situ for four days, according to currently available evidence, a supra cervical Foley catheter could be considered as an appropriate method for outpatient induction of labour [8,10,12,13]. Most women who have received outpatient cervical ripening have been very positive and satisfied with their experience, especially those who were able to self-administer vaginal isosorbide mononitrate and thus have had greater involvement and control over the process in a comfortable and supportive home environment. However they also feel 'safer' in hospital especially if they reside a significant distance away from their hospital, and their preferences vary according to the services available to them as well as their socio-demographic backgrounds [15-17].

Conclusion

Prior to induction of labour, the indications should be reviewed, informed consent obtained and appropriate measures adopted to prevent fetal or neonatal compromise as well as maternal morbidity, especially caesarean delivery due to failed induction of labour. Although the optimum dose and route of administration of misoprostol has not been determined as yet, oral misoprostol starting with 20-25 µg in solution administered hourly, with gradually increasing doses, titrated against uterine contractions, is apparently a safe and cost effective method for induction of labour in hospitals. If resources for one to one nursing care and intensive maternal and fetal monitoring are limited, a more practical regimen of oral misoprostol 50 µg administered four hourly up to a maximum of three doses per day for four days, could be implemented. For low risk women who stay close to their hospitals and prefer outpatient cervical ripening and induction of labour, the placement of a supra cervical Foley catheter, which could be kept in situ for up to four days, appears to be a suitable option. Appropriate measures should be adopted for the prevention and early detection and treatment of hyperstimulation which could occur even with low dose oral misoprostol and ascending infection which could occur with the trans cervical insertion of a Foley catheter.

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