Induction of labour

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Abstract

Induction of labour describes the artificial stimulation of the onset of labour and occurs in up to 20% of pregnancies in the United Kingdom. Both mechanical and pharmacological methods of induction of labour exist. In the vast majority of women, the recommended method of induction of labour is by the use of vaginal prostaglandin E2. Induction of labour is associated with less maternal satisfaction and potentially increased rates of instrumental delivery and caesarean section compared with spontaneous vaginal delivery. Therefore, the decision for induction of labour should not be undertaken lightly and appropriate counselling of the mother and appropriate documentation of the provision of information in addition to the indications, risks, benefits and alternatives to induction of labour is advocated.

Keywords caesarean section; induction of labour; oxytocin; prostaglandin

Introduction

Induction of labour is a method of prematurely or artificially stimulating the onset of labour prior to the onset of spontaneous labour. The incidence of induction of labour has increased over recent decades, mainly due to an accumulating body of evidence highlighting the risks to the fetus of pregnancy lasting beyond 41 completed weeks of gestation and a decreased threshold for practitioners to recommend intervention of induction of labour for a variety of indications. Approximately 5% to 10% of women will continue their pregnancy beyond 294 days or 42 completed weeks of pregnancy and these women are considered post-term and are one of the main contributors to the high incidence of induction of labour. The incidence of induction of labour varies from country to country, ranging from approximately 6% in third world countries such as Nigeria to approximately 20% in the United Kingdom in 2004–05. Although one of the commonest interventions in obstetrics, induction of labour should not be undertaken lightly as of all women who are induced, less than two-thirds will give birth without further intervention; approximately 15% will have an instrumental delivery and over 20% will deliver by emergency caesarean section. In addition, studies have demonstrated that a vast majority of women (>70%) would prefer not to have induction of labour by any means. It is therefore imperative that women be counselled appropriately antenatally regarding induction of labour, risks, benefits and alternatives.

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Physiology of labour

The normal human cervix is composed mainly of collagen and 10–15% smooth muscle and measures approximately three and a half centimetres or longer in length. The human cervix consists mainly of extracellular connective tissue with the predominant molecules of the extracellular matrix being type 1 and type 3 collagen. Intercalated among the collagen molecules are glycosaminoglycans and proteoglycans, hyaluronic acid, dermatan sulphate and heparin sulphate. Fibronectin and elastin also run among the collagen fibers and it is the release of fibronectin from the interface between the chorion and the decidua that is utilized in tests used to predict preterm labour.

It is necessary for the cervix to undergo several changes in order to stimulate the onset of labour and allow dilatation to occur. This process is known as cervical ripening and is the result of a series of complex biochemical reactions resulting in the cervix becoming soft and pliable. Late in pregnancy, hyaluronic acid, cervical collagenase and elastase increase in the cervix. This results in an increase of water molecules which intercalate among the collagen fibers. The amount of dermatan sulphate and chondroitin sulphate decreases, leading to reduced bridging among the collagen fibers. These changes, combined with decreased collagen fiber alignment, decreased collagen fiber strength, diminished tensile strength of the extracellular cervical matrix result in the ripening process. Near term, collagen turnover increases and degradation of newly synthesized collagen increases, resulting in decreased collagen content in the cervix. This is followed by myometrial contractions which result in cervical dilatation as the cervix is pulled over the presenting fetal part.

The process of cervical ripening is induced by cytokines, nitric oxide synthesis enzymes and prostaglandins and hormones such as progesterone, relaxin and oestrogen.

An increase in the enzyme cyclooxygenase-2, leads to increased local production of prostaglandin E2 (PGE2) in the cervix. The increase in PGE2 results in numerous changes to the cervix, including dilatation of small vessels in the cervix, an increase in interleukin (IL) 8 release and an increase in collagen degradation mediated by increased chemotaxis for leukocytes. Cervical ripening also involves prostaglandin F2-alpha which stimulates an increase in glycosaminoglycans. There is also increased activity of matrix metalloproteinases 2 and 9, enzymes that degrade extracellular matrix proteins.

The nitric oxide (NO) system also likely plays an integral role in the cervical ripening process and onset of labour. In the myometrium, nitric oxide synthase (NOS) activity is higher prior to the onset of labour and decreases during labour. In contrast in the cervix prior to cervical ripening, NOS activity is low and then increases at the time of labour, associated with cervical ripening. In the human cervix, ripening is associated with an increase in induced NOS (iNOS) and brain NOS expression in the cervix.

Prevention of induction of labour

The NICE guidelines on induction of labour recommend that at the 38-week antenatal visit women should be informed of the

potential for their pregnancy to continue beyond term; interventions such as membrane sweeping that may reduce post-term pregnancies and the rationale, risks, benefits and alternatives to induction of labour should be discussed.

Accurate dating of pregnancy using early antenatal ultrasound is widely accepted to help prevent high rates of induction of labour, most likely by avoiding misclassification.

To further reduce the incidence of induction of labour, it is recommended that all women are offered a sweep of the membranes after 37 weeks of gestation. Sweeping (or stripping) of the membranes involves inserting the examiner's finger through the internal os of the cervix and rotating it circumferentially. This manipulation is thought to result in the release of PGE2 from the cervix and also the release of prostaglandin F2α from the decidua and adjacent membranes. Vaginal spotting, mild abdominal cramps and slight maternal discomfort are the commonest side effects of this outpatient procedure but successive trials have conclusively demonstrated the safety of this procedure. In addition to increasing the onset of spontaneous onset of labour, sweeping of the membranes may also increase successful vaginal delivery rates. Additional membrane sweeping may be offered if there is no spontaneous onset of labour, however, the extra benefits of this remain unclear. The NICE guidelines recommend that membrane sweeping be offered to nulliparous women from between 40 and 41 weeks of gestation and multiparous women from 42 weeks. However, in practice, the sweeping of membranes is often offered earlier.

Indications for induction of labour

Labour may be induced for maternal or fetal indications. The decision to induce is made after consideration of maternal factors such as well-being, cervical assessment, parity, previous mode of delivery and fetal factors such as gestational age, growth and well being of the fetus. Numerous indications exist for the induction of labour. Commonly accepted indications for induction of labour include:

- Post-term pregnancy (41–42 weeks' gestation)
- Premature rupture of membranes greater than 37 weeks' gestation with no spontaneous onset of labour occurring within 24 h. After 37 weeks' gestation women may also be offered expectant management in the absence of any signs or symptoms of chorioamnionitis.
- Preterm prelabour rupture of the membranes: if membranes have ruptured <37 weeks' gestation, generally induction of labour is withheld until 37 weeks' gestation provided there is no evidence of fetal or maternal sepsis.
- Obstetric related problems such as pregnancy induced hypertension or pre-eclampsia greater than 37 weeks' gestation.
- Maternal medical conditions such as type 1 diabetes in which a prolonged pregnancy (>40 weeks) may result in increased risk to the fetus and mother.
- Maternal request: the NICE guidelines recommend that women should not be routinely offered induction of labour on maternal request alone.
- History of precipitate labour: although common practice, again, the NICE guidelines recommend that women should not be routinely offered induction of labour due to a history of precipitate labour.
- Intrauterine fetal death: the choice of mode of induction of labour following intrauterine fetal death is generally oral mifepristone, followed by vaginal PGE2 or vaginal misoprostol.
- Fetal macrosomia: increasingly women are been offered induction of labour for suspected fetal macrosomia. However, there is insufficient evidence that induction of labour improves maternal or fetal outcomes and is not recommended by the NICE guidelines.

Regardless of the indication, induction of labour has a significant health impact on the woman and her baby particularly if the cervix is unfavourable. If induction of labour is to be offered to the mother, then there should be clear evidence that the induction of labour is beneficial to the mother and/or the fetus. Therefore the decision to undertake induction of labour needs to be thoroughly discussed with the mother and alternatives and risks be clearly explained and documented.

Contraindications to induction of labour

The common contraindications to induction of labour presented in Table 1 are also generally considered to be indications for caesarean section. In addition to these contraindications, other scenarios exist in which caution should be exercised and senior

Contraindications to induction of labour

Maternal contraindications to induction of labour	• Previous transmural uterine surgery in which the full thickness of the myometrium has being disrupted, e.g. myomectomy. • Previous multiple caesarean sections (>2 previous caesarean sections is considered a contraindication for an induction of labour). • Previous classical caesarean section. • Unexplained maternal pyrexia. • Regular contractions. • Active herpes. • Previous traumatic or difficult delivery.
Fetal contraindications to induction of labour	• Malpresentation such as a face or brow presentation. • A breech presentation is considered by most to be a contraindication to induction of labour. External cephalic version should instead be offered and delivery by caesarean section considered if the baby remains breech. • Transverse fetal lie. • Cord prolapse. • Non-reassuring fetal state such as evidence of severe fetal growth restriction.
Placental contraindications to induction of labour	• Placenta previa. • Vasa previa. • Unexplained vaginal bleeding.

Table 1