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Guidelines for the Management of Pregnancy at 41+0 to 42+0 Weeks

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Abstract

Objective: To provide evidence-based guidelines for the management of pregnancy at 41+0 to 42+0 weeks.

Outcomes: Reduction of perinatal mortality associated with Caesarean section at 41+0 to 42+0 weeks of pregnancy.

Evidence: The Medline database, the Cochrane Library, and the American College of Obstetricians and Gynecologists and the Royal College of Obstetricians and Gynecologists, were searched for English language articles published between 1966 and March 2007, using the following key words: prolonged pregnancy, post-term pregnancy, and postdates pregnancy. The quality of evidence was evaluated and recommendations were made according to guidelines developed by the Canadian Task Force on Preventive Health Care.

Recommendations

1. First trimester ultrasound should be offered, ideally between 11 and 14 weeks, to all women, as it is a more accurate assessment of gestational age than last menstrual period with fewer pregnancies prolonged past 41+0 weeks. (I-A)
2. If there is a difference of greater than 5 days between gestational age dated using the last menstrual period and first trimester ultrasound, the estimated date of delivery should be adjusted as per the first trimester ultrasound. (I-A)
3. If there is a difference of greater than 10 days between gestational age dated using the last menstrual period and second trimester ultrasound, the estimated date of delivery should be adjusted as per the second trimester ultrasound. (I-A)
4. When there has been both a first and second trimester ultrasound, gestational age should be determined by the earliest ultrasound. (I-A)
5. Women should be offered the option of membrane sweeping commencing at 38 to 41 weeks, following a discussion of risks and benefits. (I-A)
6. Women should be offered induction at 41+0 to 42+0 weeks, as the present evidence reveals a decrease in perinatal mortality without increased risk of Caesarean section. (I-A)
7. Antenatal testing used in the monitoring of the 41- to 42-week pregnancy should include at least a non-stress test and an assessment of amniotic fluid volume. (I-A)
8. Each obstetrical department should establish guidelines dependent on local resources for scheduling of labour induction. (I-A)

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Key Words: Labour, induction, postdates pregnancy, post-term pregnancy

INTRODUCTION

The World Health Organization defines a post-term pregnancy as one that has extended to or beyond 42 weeks (294 days) of gestation.[1] In 1997, the SOGC published clinical practice guidelines recommending that women with an uncomplicated pregnancy who reach 41 to 42 weeks' gestation should be offered elective delivery.[2]

Sue-A-Quan et al. undertook a Canadian study to examine trends over time in the rates of induction in post-term pregnancies.[3] The proportion of births occurring at 41 weeks' gestation increased significantly from 11.9% in 1980 to 16.3% in 1995, and the proportion of births occurring at 42 weeks or more decreased significantly from 7.1% in 1980 to 2.9% in 1995. The authors reported that the rate of labour induction increased significantly between 1980 and 1995 among women delivering at 41 or more weeks' gestation, which indicates that the guidelines are, for the most part, being followed. The stillbirth rate was also examined in the study by Sue-A-Quan and colleagues. Interestingly, the stillbirth rate among deliveries at 41 or more weeks' gestation decreased significantly from 2.8/1000 total births in 1980 to 0.9/1000 total births in 1995 ($P < 0.001$).

Concern about increased risk to the post-term (≥ 42 weeks) fetus has existed since the early to mid 1900s.[4] Increased PMRs for the post-term fetus have been reported in descriptive studies.[4,5] However, these studies did not exclude all high-risk pregnancies or fetuses with congenital anomalies. Older descriptive studies that did correct for congenital anomalies did not find any difference in PMRs for post-term infants.[6,7] More recent database studies have demonstrated an increasing risk of stillbirth with advancing gestational age.[8–11] However, a Canadian database study did not demonstrate an increased post-term PMR.[12] Other obstetrical and perinatal complications that were found to be higher in post-term pregnancies in these non-randomized studies include fetal distress, non-progression, operative delivery (both operative vaginal and Caesarean), macrosomia, shoulder dystocia, low Apgar scores, and meconium aspiration.[12–14] A linear decline of umbilical artery pH from term has also been described.[15] Kitlinski et al.[15] collected data on singleton pregnancies planned for vaginal delivery after 37 completed weeks. They defined acidemia as a pH < 7.10 and a gestational age-dependent acidemia as a pH < mean-2 SDs. Their data show that the mean umbilical cord arterial blood pH at birth decreases linearly with gestational age. The odds ratio trend curve for low pH according to the gestational age-dependent definition of < mean-2 SDs showed no linear association with gestational age but a significant increase after 42 weeks (OR 1.24; 95% CI 1.05–1.47). The odds ratio for pH < 7.10 among infants born after 41 weeks 3 days was also significant at 1.48 (95% CI 1.26–1.72).

The RCT is the most reliable form of scientific evidence, as it is the best known design for eliminating biases that can compromise the validity of research. Controversy about the management of and the risks associated with the post-term pregnancy led to the performance of many RCTs designed to determine if induction before or at the start of the post-term period versus expectant management results in any difference in maternal or perinatal outcomes.

This document updates the 1997 SOGC Guideline.[2] Its recommendations refer only to otherwise uncomplicated pregnancies at 41 to 42 weeks' gestation. This guideline reviews the following:

1. Interventions to decrease the incidence of pregnancy beyond 41+0 weeks.
2. The evidence for induction of labour versus antenatal surveillance in an uncomplicated pregnancy at 41+0 to 42+0 weeks.
3. The role of antenatal fetal surveillance in the uncomplicated pregnancy at 41+0 to 42+0 weeks.

Sources of information include Medline, the Cochrane Library, and guidelines from the American College of Obstetricians and Gynecologists and the Royal College of Obstetricians and Gynaecologists. The quality of evidence was evaluated and recommendations were made according to guidelines developed by the Canadian Task Force on Preventive Health Care (Table).[16]

ABBREVIATIONS

CI	confidence interval
CRL	crown–rump length
EDC	estimated date of conception
LMP	last menstrual period
NST	non-stress test
OR	odds ratio
PMR	perinatal mortality rate
RCT	randomized controlled trial
RR	relative risk

INTERVENTIONS TO REDUCE PREGNANCY DURATION BEYOND 41+0 WEEKS

Accurate Pregnancy Dating

Error is associated with pregnancy dating by LMP alone. If the gestational age is underestimated, prematurity may be misdiagnosed, and unnecessary obstetric interventions performed. However, overestimation of gestational age is more likely, increasing the risks of unnecessary induction of labour.

Dating gestational age with LMP alone assumes both accurate recall of the LMP and ovulation on the 14th day of the menstrual cycle. Error in estimating LMP is due to inaccurate patient recall, maternal preference of date of LMP, and random error.[17] The duration of the follicular phase is variable, ranging from 7 to 21 days. Sixty-eight percent of women originally dated at greater than 42+0 weeks by LMP

Key to evidence statements and grading of recommendations, using the ranking of the Canadian Task Force on Preventive Health Care

Quality of Evidence Assessment*	Classification of Recommendations†
I: Evidence obtained from at least one properly randomized controlled trial	A. There is good evidence to recommend the clinical preventive action
II-1: Evidence from well-designed controlled trials without randomization	B. There is fair evidence to recommend the clinical preventive action
II-2: Evidence from well-designed cohort (prospective or retrospective) or case-control studies, preferably from more than one centre or research group	C. The existing evidence is conflicting and does not allow to make a recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making
II-3: Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category	D. There is fair evidence to recommend against the clinical preventive action
III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees	E. There is good evidence to recommend against the clinical preventive action
	L. There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision-making

*The quality of evidence reported in these guidelines has been adapted from The Evaluation of Evidence criteria described in the Canadian Task Force on Preventive Health Care.[16]
†Recommendations included in these guidelines have been adapted from the Classification of Recommendations criteria described in the The Canadian Task Force on Preventive Health Care.[16]

were actually less advanced in gestational age when basal body temperature was used to determine the ovulation date.[18]

Delayed ovulation is an important cause of perceived prolonged pregnancy.[19] Most pregnancies induced after 41+0 weeks are found not to be > 41+0 when ultrasound rather than LMP is used to date the pregnancy.[20]

Ultrasound biometry in the second trimester ultrasound is accurate for dating ± 10 days and is routinely used in the diagnosis of congenital anomalies. Biometry is most accurate if two or more parameters, such as biparietal diameter, abdominal circumference, and femur length, are used to estimate gestational age.[21] Pregnancies noted to be term by second trimester ultrasound dating, but pregnancies post-term by LMP estimate do not have an increased risk of adverse fetal outcome.[22] Induction of labour for post-term pregnancy is decreased when gestational age is estimated using second trimester biometry versus LMP alone.[23–25] When pregnancies are dated from a second trimester ultrasound, delivery past 41+0 weeks occurs in 16.3%, compared with 6.7% dated from a first trimester ultrasound.[26]

Gestational age is most accurately determined by first trimester CRL, with an error estimated to be ± 5 days. In addition to accurate pregnancy dating, first trimester ultrasound allows for early diagnosis of missed abortion, ectopic pregnancy, multiple gestations, and limited assessment of fetal anatomy. A study involving 44 623 births in a Canadian tertiary centre demonstrated that the use of first trimester ultrasound for dating significantly decreases the incidence of birth after 41+0 and 42+0 weeks of gestation. Different algorithms for combining LMP and CRL estimates were compared. The lowest rates for delivery at > 41+0 or > 42+0 weeks were seen with using early ultrasound alone for pregnancy dating (11.2% and 1.9%, respectively) and changing the EDC if the discrepancy was > 3 days between LMP and CRL (11.7% and 1.9%). These data are compared with the results of using LMP alone (20.9% and 6.4%) or changing the EDC if the discrepancy was > 14 days (16.9% and 3.5%).[27]

Bukowski et al.[28] studied 3588 pregnancies in women with known LMP who had a first trimester ultrasound as part of the FASTER trial. When pregnancies were dated by the CRL rather than the LMP, pregnancies reaching ≥ 41+0 were less frequent. The number of pregnancies at ≥ 41+0 weeks (8.2% vs. 22.1%; [P < 0.001, RR 0.37; 95% CI 0.33–0.4]), and at ≥ 42+0 weeks (1.6% vs. 12.7% [P < 0.001, RR 0.13; 95% CI 0.1–0.2]) at birth was significantly reduced when gestational age was determined by CRL, compared with determination of gestational age by LMP.[28]

Bennett et al.[29] conducted an RCT of routine first trimester ultrasound and the rate of post-term induction in a low-risk obstetric population. Two hundred eighteen women were randomized to first trimester ultrasound (EDC changed if > 5 days different from LMP) or second trimester ultrasound (changed if > 10 days different from LMP dates) to determine the gestational age. Routine use of first trimester ultrasound demonstrated a statistically and

clinically significant reduction in induction of labour for pregnancy ≥ 41+0 from 13% to 5% (P = 0.04, RR 0.37; 95% CI 0.14–0.96). There was no difference between the two groups in induction of labour for other indications, mode of delivery, or neonatal outcomes.[29] There are no studies investigating the cost-effectiveness of using first trimester ultrasound to decrease induction of labour between 41+0 and 42+0 weeks.

Routine first trimester ultrasound reduces error in estimating gestational age and induction of labour between 41+0 and 42+0 weeks.[30] Other benefits of early ultrasound include measurement of nuchal translucency,[31] visualization of other markers of aneuploidy,[32] and early diagnosis of some anatomical anomalies.[33]

Recommendations

1. First trimester ultrasound should be offered, ideally between 11 and 14 weeks, to all women, as it is a more accurate assessment of gestational age than last menstrual period with fewer pregnancies prolonged past 41+0 weeks. (I-A)
2. If there is a difference of greater than 5 days between gestational age dated using the last menstrual period and first trimester ultrasound, the estimated date of delivery should be adjusted as per the first trimester ultrasound. (I-A)
3. If there is a difference of greater than 10 days between gestational age dated using the last menstrual period and second trimester ultrasound, the estimated date of delivery should be adjusted as per the second trimester ultrasound. (I-A)
4. When there has been both a first and second trimester ultrasound, gestational age should be determined by the earliest ultrasound. (I-A)

Sweeping of Fetal Membranes

Sweeping (or stripping) of membranes off the lower uterine segment has been reported since the 19th century and is believed to stimulate the onset of labour. During a vaginal examination, the fetal membranes are separated from the cervix and lower uterine segment as far as possible, sweeping a finger inserted through the cervical os 360º if possible. This procedure necessitates a sufficiently dilated cervix, usually representing a favourable Bishop score. When the cervix is closed, some clinicians attempt to stretch the cervix open or perform cervical massage. There are no trials comparing these different techniques. Sweeping results in the release of endogenous prostaglandins, softening the cervix and augmenting oxytocin-induced uterine contractions.[34] Plasma prostaglandin concentrations after sweeping are 10% of those achieved in labour, thus possibly improving labour outcomes.[35]

Theoretical risks of membrane sweeping include chorioamnionitis, premature rupture of membranes, and bleeding from an undiagnosed placenta previa. However, in review of clinical trials, there was no increased incidence of fetal infection or neonatal morbidity related to the procedure. A small study did not find any increased colonization with group B streptococcus during membrane sweeping.[36] Maternal morbidity is related mainly to significant discomfort or pain during procedure, bleeding, and contractions not leading to labour within 24 hours.[37,38]

In an RCT investigating indicated induction of labour at 39 weeks in conjunction with membrane sweeping, the beneficial effect of membrane sweeping was limited to nulliparous women with unfavourable Bishop scores. In this patient group, both the induction-to-labour interval and oxytocin use were decreased, and there was an increased rate of normal vaginal delivery.[39] Weekly membrane stripping preceding induction of labour has similar effects.[40] However, the need for an intervention (sweeping membranes) at 38 weeks to routinely shorten pregnancy has been widely questioned in the literature. The results of membrane sweeping are not predictable and should not be used alone for induction if the indication for induction is urgent.

In several small trials, membrane stripping has been an effective outpatient method to reduce the number of patients with pregnancies exceeding 41+0.[41–44] Again, membrane sweeping is generally most efficacious in nulliparous women with unfavourable Bishop scores. In a study by Berghella et al.,[45] patients were randomized to weekly sweeping of membranes or gentle exams starting at 38 weeks. Time to delivery was significantly decreased with membrane stripping, and there were fewer pregnancies reaching past 41+0 weeks.[45] Not all studies have noted a reduction in the need for post-term induction.[46] A well-designed Canadian study enrolled patients at 38 to 40 weeks, and did not find any differences between a single membrane sweeping and routine examination with respect to onset of after 41 weeks or need for induction of labour.[47] Multiple episodes of membrane sweeping may be more efficacious. There are no trials comparing single and multiple sweepings of the membranes.

A recently published RCT by de Miranda et al.[48] randomized 750 low-risk pregnant women from the Netherlands at 41 weeks' gestational age to routine monitoring or membrane sweeping every two days until spontaneous labour or 42 weeks' gestational age. Sweeping was defined as separating the lower membranes as much as possible from their cervical attachment, with three circumferential passes of the examining fingers. If the cervix was closed, cervical massage was performed. Analysis was by intention-to-treat. Serial sweeping of the membranes decreased the risk of

pregnancy reaching 42+0 weeks (87/375 [23%] versus 149/367 [41%]); RR 0.57 [95% CI 0.46–0.71], NNT 6 [95% CI 4–12]).[48] Benefits were noted in both nulliparous and multiparous patients. Uncomplicated vaginal bleeding was reported more frequently in the sweeping group (111/364 vs. 16/345, RR 6.58 [95% CI 3.98–10.87]). As well, 68% of treated women reported sweeping as "somewhat" to "very painful." Of note, 88% of all women randomized to sweeping reported that they would chose sweeping in the next pregnancy, despite the discomfort. Obstetric outcomes and neonatal morbidity were similar between groups.[48]

A recent Cochrane review assessed 22 trials involving sweeping membranes. Sweeping of the membranes at term (38–41 weeks) reduced the frequency of pregnancies continuing after 41+0 weeks (RR 0.59; 95% CI 0.46–0.74) and after 42+0 weeks (RR 0.28; 95% CI 0.15–0.50). Eight women would need to undergo sweeping of membranes to prevent one induction of labour.[38]

Recommendation

5. Women should be offered the option of membrane sweeping commencing at 38 to 41 weeks, following a discussion of risks and benefits. (I-A)

LABOUR INDUCTION VERSUS EXPECTANT MANAGEMENT AT 41 WEEKS

Nineteen trials randomizing women with uncomplicated pregnancies at 41 or more weeks' gestation to induction or expectant management with surveillance were identified.[49–67] A recently published trial randomized women at 41 weeks and two days of gestation to induction or expectant management; however, the authors do not specify if the pregnancies are uncomplicated.[68] Two of these trials are reported as abstracts only.[50,66] A trial in a Spanish journal was identified through the Cochrane Collaboration and was not reviewed for this document.[65] Nine trials began enrolment at 41+0 weeks[53,55,56,60–63,66,67] (two of these recruited at 41 weeks but did not randomize until 42 weeks);[53,62] one trial at 41+2 weeks[68]; five trials at 41+3 weeks;[49,50,52,54,64] two trials at 42+0 weeks;[51,57] and two trials at 42+1 weeks.[58,59] Dating was by various methods (menstrual cycle history, positive pregnancy tests, physical examination, and ultrasound) in each of the trials. Five trials did not use ultrasound assessment.[49,54,57,59,63] It was unclear from one of the trials published only as an abstract if ultrasound was used.[66] All trials reported perinatal mortality and delivery mode. Perinatal morbidities and other maternal outcomes were reported in variable detail. As the incidence of substantive outcomes, such as perinatal mortality and morbidity associated with post-term pregnancy are low, a large sample size would be required to detect a statistically significant difference between these two management methods. The largest trial was a Canadian multi-centre trial enrolling 3407 women.[60] The remainder of the trials had sample sizes ranging from 22 to 440.[49–59,61–64,66–68]

The Canadian trial randomized women at 41 or more weeks' gestation to induction or to serial antenatal monitoring, with delivery indicated for non-reassuring fetal status, the development of obstetrical complications, or the attainment of 44 weeks' gestation.[60] Those assigned to the induction group were to have labour induced within four days after randomization. The primary outcome of the study was perinatal mortality and neonatal morbidity. The sample size was based on finding a reduction in the incidence of an Apgar score less than 7 at five minutes. The secondary outcome was the rate of Caesarean section. The authors concluded that there was no difference in the risk of perinatal mortality or neonatal morbidity between the two management schemes. There were two stillbirths in the monitored group and none in the induction group. The two groups did not differ significantly in the rate of neonatal morbidity. The frequency of fetal distress was lower in the induction group (10.3% vs. 12.8%, $P = 0.017$). The incidence of meconium staining of the amniotic fluid was significantly lower in the induction group (25% vs. 28.7%, $P = 0.009$). There was a statistically significant higher rate of Caesarean section among women who were monitored than among those induced (24.5% vs. 21.25%, $P = 0.03$; OR 1.22; 95% CI 1.02–1.45), and this difference was due to a lower rate of this procedure for fetal distress. There were limitations in this study's methods. Prostaglandin E_2 gel was not used in the monitoring group, as the authors felt there was insufficient evidence to use this preparation in the presence of fetal compromise, and they speculated that most of the women in this group requiring induction would have evidence of fetal compromise. They acknowledge that this could account for the difference in the rate of Caesarean section. Also, this trial was not blinded, which introduces the potential for bias toward a higher Caesarean rate, as pregnancies are likely to be considered higher risk as they became further post-term. The authors conclude that labour induction in post-term pregnancies decreases the Caesarean rate but leads to no difference in the incidence of perinatal mortality and morbidity.

As the authors of the Canadian trial point out, the perinatal mortality rate in their study was low at 0.6 per 1000. They reported that to detect a reduction of 50% in the perinatal mortality rate by inducing women with post-term pregnancy, approximately 30 000 women would need to be enrolled. Such a trial does not exist and for logistical reasons is likely not to be carried out. In the absence of such a trial, clinical practice relies on information from smaller trials and from systematic reviews.

Three meta-analyses addressing labour induction versus expectant management of pregnancies at 41 weeks and beyond have been published.[69–71]

In 1993, Hannah[69] published a review of the literature on post-term pregnancy. Included in this review was a meta-analysis of 11 randomized or quasi randomized trials in which a policy of routine induction at 41 weeks was compared with expectant management with serial fetal surveillance. A total of 5057 women were included in these trials. Methods of fetal surveillance and induction varied between the studies. Ten studies reported on probability of Caesarean and the results showed that inducing labour at ≥ 41 weeks resulted in a significantly lower Caesarean section rate (OR 0.85; 95% CI 0.74–0.97). Inducing labour at ≥ 41 weeks resulted in a lower rate of fetal distress, as defined by different authors, than expectant management (OR 0.81; 95% CI 0.68–0.97) and a lower rate of meconium staining of amniotic fluid (OR 0.79; 95% CI 0.69–0.90). Labour induction at ≥ 41 weeks resulted in a lower rate of macrosomia (usually defined as birth weight < 4000 g) than expectant management (OR 0.80; 95% CI 0.69–0.92). Inducing labour at ≥ 41 weeks resulted in a lower rate of fetal or neonatal death (excluding lethal congenital anomalies) than expectant management (OR 0.23; 95% CI 0.06–0.90). The reduction in perinatal death was largely due to a reduction in fetal death (OR 0.14; 95% CI 0.02–0.98). There was no difference in other measures of neonatal morbidity, such as small for gestational age, Apgar score < 7 at one minute, Apgar score < 7 at five minutes, shoulder dystocia, cord prolapse, neonatal seizures, birth trauma, admission to NICU, and meconium aspiration syndrome. The author concludes that the induction of labour groups are less likely to undergo delivery by Caesarean, to have an operative vaginal delivery, or to have fetal distress, macrosomic babies, or babies who die during the perinatal period. She states that women who reach 41 weeks should be appropriately counselled about the higher risks to themselves and to their babies if they pursue expectant management, and she suggests that a policy of labour induction is to be preferred.

A meta-analysis published in 2003 compared routine labour induction with expectant management for patients at 41 weeks.[70] Trials consisting of uncomplicated, singleton, live pregnancies were included. The primary outcomes assessed were perinatal mortality and Caesarean section. Sixteen trials enrolling 6588 subjects were included in the review.[49–64] The trials differed in methods of antenatal fetal surveillance and means of labour induction. The meta-analysis showed that women who underwent labour induction had a significantly lower rate of Caesarean section (20.1% vs. 22%; OR 0.88; 95% CI 0.78–0.99). Those whose labour was induced required Caesarean section secondary to fetal heart rate abnormalities at a significantly lower rate than those expectantly managed (6.2% vs. 8.0%; OR 0.77; 95% CI 0.61–0.96). Those whose labour was induced were less likely to have meconium staining of amniotic fluid (22.4% vs. 27.75; OR 0.75; 95% CI 0.66–0.84). Women whose labour was induced had a lower rate of perinatal mortality; however, this difference was not statistically significant (0.09% vs. 0.33%; OR 0.41; 95% CI 0.14–1.18). Other neonatal outcomes showed no significant differences and included meconium below the vocal cords, meconium aspiration, NICU admissions, and Apgar scores < 7 at 5 minutes. The authors concluded that labour induction in women at 41 weeks' gestation with otherwise uncomplicated pregnancies lowers the Caesarean rate without compromising perinatal outcomes. As the authors state, none of these 16 trials had adequate statistical power to assess the perinatal mortality rate. Even when combined in a meta-analysis, the statistical power for assessing this outcome remained low. They calculated that 16 000 women would need to be enrolled to detect a 50% reduction in the PMR rate of 3 per 1000 with routine labour induction, compared with expectant management at a power of 80% and allowing for a type I error of 5%. To detect an even smaller reduction in the PMR that would be clinically relevant, would require even more participants.

The Cochrane Collaboration published a review in 2006 whose objective was to evaluate the benefits and harms of a policy of labour induction at term or post-term, compared with awaiting spontaneous labour or later induction of labour.[71] Eligible trials were RCTs enrolling women at low risk. This review included three trials[65–67] not in the meta-analysis by Sanchez-Ramos et al. and excluded three trials included in that review for methodological reasons.[51,52,58] The review included 19 trials involving 7984 women undergoing induction of at various times from 38 to > 42 weeks' gestation. The review grouped the trials by gestational age of induction at (1) 37 to 40 weeks, (2) 41 completed weeks, and (3) 42 completed weeks, and compared this with waiting until a later date for induction. Subgroup analyses were also done according to the condition of the cervix. In this document, results from the 41-week and the 42-week groups from 16 trials are reviewed.[49,50,53–57,59–67] The primary outcome was perinatal mortality, which was defined as intrauterine deaths plus newborn deaths in the first week of life. Secondary infant and maternal outcomes were also assessed. Eleven trials intervened at or during the 41st completed week[49,50,54–56,60,61,63,64,66,67] and five trials at or after 42 completed weeks.[53,57,59,62,65] The relative risk of perinatal death in the 41st week group was 0.25 with 95% CI 0.05 to 1.18 (0/2835 vs. 6/2808), not statistically significant. When the 41- and 42-week groups were analyzed

together, the RR was 0.30 with 95% CI 0.09 to 0.99 (1/2986 vs. 9/2953), statistically significant. Labour induction significantly reduced the risk of meconium aspiration syndrome in the 41-week group (RR 0.29; 95% CI 0.12–0.68). In the 42-week group, fewer babies in the induction group had meconium aspiration syndrome, but the difference was not statistically significant (RR 0.66; 95% CI 0.24–1.81). There was no difference in neonatal intensive care admissions. There was no evidence of an increased risk of Caesarean section for women induced at 41 and 42 weeks, respectively (RR 0.92; 95% CI 0.76–1.12; RR 0.97; 95% CI 0.72–1.31). There was no evidence of a statistically significant difference in the risk of assisted vaginal delivery for women induced at 41 and 42 completed weeks, respectively (RR 1.05; 95% CI 0.94–1.17; RR 0.95; 95% CI 0.65–1.38). Obstetric outcomes were also analyzed according to cervical status. This subgroup analysis was limited by the small number of trials reporting cervical status. No differences between a policy of labour induction and expectant management were identified for Caesarean section or assisted vaginal birth in these analyses. The reviewers did not produce a point estimate because of significant heterogeneity for these outcomes. The authors conclude in their discussion that routine labour induction at 41 completed weeks or later, compared with waiting for the onset of labour for at least one week is associated with fewer perinatal deaths and meconium aspiration syndrome. The absolute number of perinatal deaths was small in the induction group (1/3285, 0.03%) and in the expectant management group (11/3238, 0.33%). In this review, there was one stillbirth reported among the seven trials since 1992. Excluding congenital anomalies, there were no deaths in the labour induction group and nine deaths in the expectant management group. Regarding Caesarean rates, the authors acknowledge that the data are difficult to interpret because of heterogeneity among trials. This review also analyzed the data excluding the multicentre trial by Hannah et al., which did not use prostaglandins in the expectantly managed group,[60] and reported that there did not seem to be a difference in Caesarean rates." The authors state that the effect on Caesarean section is unclear, but the rate is not increased. With respect to fetal monitoring in the expectant arms, most trials included twice weekly non-stress tests and amniotic fluid index assessments, and the authors speculate that in centres that can offer these services, expectant management could be safely practised. In conclusion, the authors state that they think the results are valid and indicate beneficial outcomes with a policy of labour induction at 41 completed weeks. They acknowledge that the risk of the primary outcome (perinatal death) is small but that such a policy is associated with fewer perinatal deaths. They state that labour induction should be offered to women at low risk at 41 weeks and that the pros and cons should be discussed so that women can make an informed decision. There does not seem to be any increased risk of Caesarean or assisted vaginal delivery with such a policy. The authors state that if a woman chooses to await spontaneous labour, regular fetal monitoring would be prudent as longitudinal epidemiological studies suggest that there is an increased risk of perinatal death with increasing gestational age.

The evidence suggests that the rate of Caesarean section is either reduced or not increased when women are induced, compared with those expectantly managed.[65,30,66] The three meta-analyses have different conclusions regarding the policy of labour induction on PMR. The Hannah review[69] demonstrated a statistically significant lower PMR with induction at 41 weeks or more. The meta-analysis by Sanchez-Ramos et al. showed a lower PMR in the induced group, but it was not statistically significant.[70] The most recent Cochrane review demonstrated a lower perinatal mortality rate for induction at 41 weeks and beyond.[71] In this review, when the group induced at or during the 41st week was analyzed, the induced group had a lower PMR, but it did not reach statistical significance. However, even when these studies are combined in a meta-analysis, there is still low statistical power to assess this outcome. When the groups induced at or during the 41st and at or during the 42nd week were combined, the PMR was lower in those induced, just reaching statistical significance. If anything, it appears induction during the 41st week may decrease the PMR, but there are inadequate numbers of enrolled women to answer this question definitively. Given that induction does not increase the risk of Caesarean and that uncertainty remains regarding whether induction at 41 to 42 weeks decreases the PMR, it would seem reasonable to offer women induction in this gestational age range.

A 2002 commentary on routine labour induction at 41 weeks' gestation noted that aggregate data to that point showed that not all of the seven perinatal deaths in the expectantly managed groups occurred in women who received contemporary fetal testing, and it is questionable whether all causes were related to pregnancy duration.[72] The stillbirth rate within the following week for women who remain undelivered at 41 weeks 0 days is about 0.1% (1.04–1.27 per 1000).[72] Concern has been expressed that obstetricians have responded to the previous SOGC guideline by booking induction by one week past the expected due date.[72] A proportion of women will labour spontaneously between 41 and 42 weeks. Provided there are no indications for delivery earlier, that fetal surveillance is employed and is reassuring, and if the patient chooses, induction at the latter end of this gestational age spectrum will maximize the chances of spontaneous labour. Each

obstetrics department should establish guidelines dependent on their local resources for scheduling of labour inductions.

Recommendation

6. Women should be offered induction at 41+0 to 42+0 weeks, as the present evidence reveals a decrease in perinatal mortality without increased risk of Caesarean section. (I-A)

FETAL SURVEILLANCE IN THE 41 TO 42 WEEK PREGNANCY

Options for fetal surveillance include fetal movement counting, non-stress test, biophysical profile or modified biophysical profile (non-stress test plus amniotic fluid volume estimation), and contraction stress test. In each of the aforementioned randomized trials of labour induction, compared with expectant management of the post-term patient, some form of antenatal test of fetal well-being was used at varying frequencies.[49–64,66–68] There is a paucity of data from randomized trials on the type and frequency of fetal surveillance in post-term pregnancy. There has been only one randomized trial on forms of antenatal testing in the post-term pregnancy.[73] Alfirevic et al. randomized 145 women with singleton, uncomplicated pregnancies after 42 weeks to a modified biophysical profile defined as computerized cardiotocography, amniotic fluid index, and assessment of fetal breathing, tone, and gross body movements or to standard cardiotocography and maximum pool depth. Women were monitored at randomization and then twice weekly until 43 weeks. Outcome measures were cord pH at delivery, number of abnormal monitoring tests, intrapartum management, mode of delivery, and neonatal outcome. There were significantly more abnormal monitoring results in the modified biophysical group (47.2% vs. 20.5%; OR 3.5; 99% CI 1.3–9.1). Amniotic fluid volume was more likely to be labelled abnormal with amniotic fluid index than with maximum pool depth (44.4% vs. 15.1%; OR 4.5; 99% CI 1.6–12.8). There were no differences in cord blood gases, neonatal outcome, or outcomes related to labour and delivery between the two groups. These results suggest that monitoring pregnancies with their definition of a modified biophysical profile after 42 weeks does not improve pregnancy outcome as measured by cord pH; however, the number of patients included in this trial is insufficient to reach any definitive conclusions about the impact of fetal testing on outcomes in post-term pregnancies.

There are no randomized trials regarding antepartum fetal testing between 41 and 42 weeks. The commencement of antenatal testing at 41 weeks' gestation is supported by case-control studies. Guidetti et al.[74] reported on 293 women at low risk who began twice weekly testing at 41 weeks' gestation with an NST and amniotic fluid volume assessment. The control population consisted of 59 women at low risk delivered between 39 and 41 weeks' gestation, who were referred for routine testing at term. The outcome parameters studied were abnormal NST, oligohydramnios, Caesarean section for fetal distress, Apgar score ≤ 6 at five minutes, NICU admissions, and perinatal deaths. When the study group delivering at 41 to 42 weeks were compared with the control group, the former had a statistically significant increase in the incidence of abnormal NSTs, oligohydramnios, Caesarean section for fetal distress, and admissions to the neonatal unit. When the study group who were delivered between 41 and 42 weeks were compared with those delivered after 42 weeks, the only significant difference was that the former had more abnormal NSTs. Bochner et al.[75] compared neonatal outcomes of patients with antenatal fetal testing starting at 41 weeks' gestation with patients who delivered between 41 and 42 weeks without testing and those who started testing at 42 weeks. All patients were at low risk. The study population consisted of 1260 women. Of these, 908 started testing at 41 weeks, and 352 started at 42 weeks. The control group consisted of 1807 women who delivered between 41 and 42 weeks without any antenatal testing. Antepartum testing consisted of twice weekly amniotic fluid assessment, NST, and contraction stress test when necessary. The total number of adverse outcomes in the untested group resulted in a significantly increased incidence of neonatal morbidity (seizures, apnea, pneumonia, severe meconium aspiration, or infection), compared with the tested group. Those who delivered after 42 weeks and whose testing started at 41 weeks had significantly fewer abnormal antepartum testing results leading to labour induction and Caesarean sections due to fetal distress than whose testing started at 42 weeks. The group whose testing started at 42 weeks had a significantly greater incidence of fetal distress.

Despite the lack of evidence from RCTs that antenatal testing improves perinatal outcome in uncomplicated pregnancies at 41 to 42 weeks' gestation, most practitioners utilize some form of monitoring in this clinical situation. The randomized trials comparing labour induction with expectant management at 41 weeks and beyond have included fetal assessment.[49–64,66–68] For most trials, those women who were randomized to induction did not undergo antenatal surveillance. In eight trials, however, fetal assessment was carried out before patients were eligible for study enrolment, and they therefore had some type of fetal surveillance between 41 and 42 weeks.[51,53,55,56,61,62,67,68] Therefore, for some pregnancies, fetal surveillance started at 41 weeks and for others at 42 weeks. For some women, fetal monitoring was started at 41 weeks but only if they were randomized to

expectant management. Those randomized to expectant management underwent fetal surveillance of various types and at various intervals from randomization to delivery. Most studies carried out fetal testing at least twice per week. Twelve studies included assessment of amniotic fluid volume and an NST for women randomized to expectant management.[50,52,55,56,60–64,66–68] The Canadian trial, which is the largest, utilized amniotic fluid volume two to three times per week, NST three times weekly, and daily fetal movement counts.[60] A reasonable approach would be at least an NST and some type of amniotic fluid assessment twice weekly. The American College of Obstetrician and Gynecologists have a Level C recommendation (consensus and expert opinion) for initiation of fetal surveillance between 41 and 42 weeks because of evidence that perinatal morbidity and mortality increase as gestational age advances and that a twice weekly assessment of amniotic fluid and a NST should be adequate.[76] The Royal College of Obstetricians and Gynaecologists recommends increased antenatal surveillance consisting of a twice weekly NST and an ultrasound estimation of maximum amniotic pool depth from 42 weeks in women who decline labour induction.[77]

Recommendations

7. Antenatal testing used in the monitoring of the 41- to 42-week pregnancy should include at least a non-stress test and an assessment of amniotic fluid volume. (I-A)

8. Each obstetrical department should establish guidelines dependent on local resources for scheduling of labour induction. (I-A)

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