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Outcome of Post-Term Pregnancy: A Matched-Pair Case-Control Study

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Aim. Matched-case control study was performed to assess perinatal mortality and fetomaternal morbidity related to the post-term pregnancy.

Methods. 124 patients who delivered after 42 weeks of pregnancy were matched by age and parity with a control group of patients who delivered at term. Perinatal mortality and neonatal morbidity, as well as maternal morbidity were analyzed in both groups and differences tested for statistical significance.

Results. There was no statistically significant difference in perinatal mortality between the two groups (1 vs. 0; $p > 0.05$). A statistically significant difference was found in the umbilical cord blood sample base excess after delivery in the post-term group. Cesarean section rate was higher in the post-term group (-6.1 vs. -4.9, $p < 0.05$). If spontaneous labor occurred, there were no statistically significant differences in any of the analyzed parameters between the groups ($p > 0.05$).

Conclusion. Post-term pregnancy was related to higher maternal and neonatal morbidity, but the risks were biased by higher induction of labor rate and more frequent monitoring resulting in a higher intervention rate.

Key words: Apgar score; blood gas analysis; cesarean section; fetal blood; neonatal diseases and abnormalities; perinatal mortality; pregnancy, prolonged

The World Health Organization and International Federation of Gynecologists and Obstetricians define the term delivery as that occurring between 259 and 294 days of pregnancy (1). If the pregnancy exceeds this period, it is classified as post-term (PTP). Despite intensive research, management of PTP is still controversial and varies, not only among different countries and hospital units, but also among different clinicians in the same unit.

The incidence of PTP varies, ranging from 3% to 14%, with the average of about 10%. The true proportion of pregnancies prolonged beyond 42 weeks should be calculated from a population in which every event is recorded. Pregnancy should be known from conception, no pregnancy should be lost from the follow-up and there should be no interference with the natural course of pregnancy, all of which are virtually impossible to obtain in clinical practice. Another difficulty is uncertain date of the last menstrual period, which is often the case. The incidence of PTP varies depending on whether the calculation is based on the history and clinical examination alone, or whether early pregnancy ultrasound examination is used to estimate gestational age (2,3). The assessment of the gestational age by early ultrasound examination has reduced the "incidence" of PTP by 50% (2).

In the management of PTP there are two options: 1. induction of labor when pregnancy reaches "term", or 2. expectant conservative management with serial tests of fetal well-being leading to spontaneous labor, or induction of labor if there is evidence of fetal or maternal compromise.

Unfortunately, it is still unclear which of these options is better (4). Several reports associate PTP with increased perinatal mortality (5) and increased maternal morbidity related to operative delivery following spontaneous or induced labor (6). Induction of labor is also related to the risk for mother and fetus. In a large survey from 1970, the perinatal mortality following induced PTP was twice as high as that following spontaneous labor (7). At present, data from randomized control trials favor a policy of inducing labor after 41 completed weeks of gestation because induction of labor is not as hazardous as it was claimed in the past and, if it is performed appropriately, it can even reduce the likelihood of delivery by cesarean section (4).

In expectant conservative management, fear of intrauterine death is present in both pregnant women and physicians. The published data on risk of unexplained intrauterine death associated with PTP vary. Some authors claim that risk is low, whereas other studies present the risk as being twice as that in term births (8). Factors claimed to increase perinatal mortality rate in PTP include amniotic fluid infection, abruptio placentae, large placental infarcts, and growth retarded placentae. Despite these risks, Cardoso reports that increased fetal monitoring is the most acceptable management of PTP (9). Many women also express their preference for minimal interference in childbirth. The data from

randomized control trials suggest that induction of labor may reduce perinatal mortality in PTP (4). To assess some aspects of maternal and fetal outcome of post-date pregnancies, a case-control study was performed, comparing a group of women conservatively managed, monitored, and delivered post term with a group of women delivered at term.

Patients and Methods

From January 1993 to January 1994, 145 patients entered a post-dates protocol at Liverpool Maternity Hospital and were recruited for a randomized control trial of simple compared to complex antenatal fetal monitoring after 42 weeks of gestation (10). These women were followed and delivered after 42 weeks of gestation (post-term group). They entered a post-dates protocol starting at 42 weeks of gestation which consisted of routine antenatal assessment (blood pressure, urine analysis), computerized cardiotocography, and ultrasound examination for the assessment of amniotic fluid. The investigations were performed twice between 42 and 43 weeks and if the results were normal, the patients were induced at 43 weeks. If any abnormal finding was present, the patients were induced within 24 hours. The exceptions were nulliparous women booked under the care of one consultant who were induced at 290 days (40 weeks+10 days) of pregnancy. However, they were not successfully matched and were therefore excluded from the study.

All the women in the study group were matched by age and parity in the case-control study with a control group of patients delivered at term (term group).

Entry criteria for both groups were: (a) uncomplicated singleton pregnancy; (b) no medical disorder which could influence pregnancy outcome; and (c) no need for additional fetal monitoring (i.e., ultrasound for intrauterine growth retardation or antepartum hemorrhage, cardiotocography, etc.) after 24 weeks of gestation. Exclusion criteria for both groups were contraindication for vaginal delivery and uncertain last menstrual period with late booking and ultrasound examination after 20 weeks of gestation.

Patients were matched using the labor ward birth register. When a patient from the post-term group was localized in the birth register, the next patient delivered at term of the same age and parity was chosen for the term group. A maximum of three months between deliveries was used as the period for successful matching and the age difference of ± 1 year was accepted. All case notes were reviewed and if the patient from the term group did not meet the entry criteria, the next appropriate patient from the birth register was chosen and matched to the patient in the post-term group. Only successfully matched pairs were used for the further analysis.

The assessed outcomes included perinatal mortality and neonatal morbidity. Perinatal mortality was defined as stillbirth or early neonatal death before hospital discharge. Neonatal morbidity was defined as an Apgar score less than 7 after one minute or abnormalities in the umbilical cord (umbilical vein sample) blood pH and base excess or admission to Neonatal Intensive Care Unit (NICU). The secondary outcomes assessed in this study were the mode of delivery, the incidence of fetal distress determined by abnormal cardiotocography monitoring and fetal blood sampling, and the presence of the meconium.

Statistical analysis was performed using the Arcus Pro-Stat program, Version 3.03 (Medical Computing, Aughton, UK). Since the data were not normally distributed, the Wilcoxon's signed rank (matched pairs) test was used for the numeric values analysis, whereas McNemar test after Liddell's correction was used for the contingency tables analysis (11). A p value of <0.05 was accepted as demonstrating a statistically significant difference.

Results

Of the 145 patients included in the randomized control trial (10), 124 (85.5%) were successfully matched. The general data on women in both groups are shown in Table 1. In many of the records analyzed, data related to height and weight were missing in the control group because they were not recorded on the admission, whereas in the study group they were recorded on randomization, and consequently noted in all cases. A statistically significant difference was obtained only in the duration of pregnancy. The term-group of patients was successfully matched to the post-term group because differences in age, height, weight, and parity were not statistically significant. The onset of labor in both groups is presented in Table 2. Three women in the term-group were induced because of abnormal findings; two of them because of abnormal CTG monitoring following hospital admission with a history of absence of fetal movements, and one patient was induced because of non-proteinuric hypertension. Six patients induced in the post-term group listed as "other" include three patients with non-proteinuric hypertension, a case of polyhydramnios, significant proteinuria, and a case of the antepartum hemorrhage which occurred after the patient was randomized for a post-date protocol.

Table 1: General data on women in the term and post-term delivery group. [\[view this table\]](#)

Table 2: The onset of labor in the term and post-term delivery groups. [\[view this table\]](#)

Table 3: Labor characteristics in the term and post-term delivery groups. [\[view this table\]](#)

The characteristics of labor are presented in Table 3. A significantly higher number of women in the post-term group were classified as having abnormal CTG monitoring requiring immediate delivery ($p < 0.05$). It is an interesting observation that amniotic fluid leakage in labor was absent in a higher proportion in the post-term group compared to the term group. The incidence of cesarean section was found to be higher in the post-term group of patients compared to the term group and this difference was statistically significant ($p < 0.05$) (Table 4).

The neonatal outcome is shown in Table 5. A statistically significant difference was observed for birth weight, with post-term infants being heavier than term babies ($p < 0.05$). The umbilical cord blood sample base deficit immediately after delivery was greater in the post-term compared to the term group ($p < 0.05$), whereas no difference was found between umbilical cord blood pH values and the Apgar score obtained after one minute. No statistically significant difference was found for the incidence of perinatal and early neonatal death, nor for the admissions to NICU after delivery. There were two admissions to the NICU in the post-term group; one because of infection and one because of hemothorax of unknown cause. The admission to NICU in the term group was because of cardiac anomaly which was not detected antenatally.

Subsequent analysis was performed to compare a group of 57 women with spontaneous labor in the post-term group and their pairs in the term group (Tables 6 and 7). No statistically significant differences at the 95% statistical significance level were found between any of the measured parameters.

Table 4: Mode of delivery in term and post-term delivery groups. [\[view this table\]](#)

Table 5: Neonatal data in term and post-term delivery groups. [\[view this table\]](#)

Table 6: Characteristics of labor and mode of delivery in patients in the term and post-term groups with spontaneous labor. [\[view this table\]](#)

Table 7: Neonatal data on patients with spontaneous labor in term and post-term delivery groups. [\[view this table\]](#)

Discussion

PTP is a subject of interest because of its presumed association with increased fetal and maternal mortality and morbidity. Primary outcomes of this study were defined as perinatal mortality and neonatal morbidity. One case of perinatal death (unexplained intrauterine death) in the post-term group and no death in the term group were not statistically significant. To prevent unexplained intrauterine death by mass elective delivery before these fetuses die is hardly feasible. If the reported relative average risk of stillbirth after 42 weeks is approximately 0.24% (8), it is necessary to include approximately 30,000 women in a trial to detect a reduction of 50% in perinatal mortality comparing the two policies for the management of PTP. Cumulative data from the Oxford Database of Perinatal Trials (4) suggested that a policy of inducing labor in PTP may decrease the perinatal mortality rate compared to the expectant policy but the difference was not statistically significant.

Other primary outcome evaluated in this study was neonatal morbidity. Despite the higher number of babies in the post-term group with a Apgar score less than 7 at one minute (19%) compared to the term group (10%), this difference was not statistically significant. In the large study of Hannah et al (12), the reported incidence of Apgar score less than 7 at one minute in post-term pregnancy was approximately 12%. In the same study, no differences were found between Apgar scores less than 7 at one, five or ten minutes, despite management of post-term pregnancy (induction vs. monitoring), but some authors suggest that induction of labor itself may influence this result because women with induced labor are more likely to have babies with low Apgar score (9). The difference between the admissions to NICU in the post-term group compared to the term one was not found to be statistically significant. According to this finding, post-term pregnancy is not related to increased neonatal morbidity. There was no statistically significant difference in the umbilical cord blood pH analysis (7.30 vs. 7.31, $p = 0.46$), but there was a significantly lower base excess in the babies in the post-term group (-6.1 vs. -4.9, $p < 0.01$). Some authors define a postmature fetus as one who has outgrown the ability of the placenta to supply oxygen and nutrients and it is at risk of morbidity from starvation or lack of oxygen (13). The lower base excess in the post-term group suggests that the placental supply was more often insufficient in this group because of a diminished placental function, but several other different parameters may also have contributed to this observation.

It is shown in this study that PTP is related to a significantly higher incidence of the cesarean section compared to term pregnancies, but it is impossible to conclude from the obtained results whether this

was influenced by a higher labor induction rate in the post-term group. The cesarean section rate for failed induction of labor rises from 1.4% to 45.8% in nulliparous women if Bishop cervical score is 7–10, compared to 0–3 (14). The published data are contradictory but the complications during spontaneous labor increase progressively from 37 weeks of gestation towards “term” (15). Induction of labor was found to be related to a higher operative delivery rate in retrospective analysis, but not in a randomized control trials (5,15). In this study, separate analysis of the women who spontaneously went into labor, with the absence of a statistically significant difference in cesarean section rate between the two respective groups (Table 6), supports the view that PTP itself does not increase the cesarean section rate.

Higher incidence of abnormal CTG monitoring in PTP found in this study (Table 3) may be due to a more frequent monitoring in this group compared to the control, and cannot be used as a conclusion about fetal compromise. The presence of the meconium in the post-term group was higher compared to the term one, which is to be expected at a later gestation. Although not statistically significant, it may contribute to a higher cesarean section rate (12). In the post-term group, the relative absence of amniotic fluid leakage in labor was reported in the case notes of 5.6% of cases, whereas no such observation was reported in the term group. In all of these cases, the underlying etiology was excluded and oligohydramnios was related to the reduced production of the urine in the fetuses after 40 weeks of gestation. Unfortunately, interobserver variability has to be kept in mind and statistical importance of this observation was questionable. Policy of the amniotic fluid measurement in conservative expectant management of the PTP is well established (16), but it has to be stressed that the value of amniotic fluid assessment in the prevention of perinatal mortality and morbidity has never been evaluated in randomized control trials and may lead to more unnecessary obstetric interventions.

A large randomized control trial comparing induction of labor at “term” (41 week) with the expectant care was published in 1992 (12). The most important finding in 3,407 women participating in the trial was a lower cesarean section rate in the induction of labor group and no difference in the mortality and neonatal morbidity between both groups. It has to be stressed that in this study the intervention rate was 49% among women randomized to induction of labor and 51% in the expectant group, which we consider unacceptably high.

The absence of statistically significant differences in defined primary and secondary outcomes between the group of post-term patients and the term ones who spontaneously went into labor, supports the view that PTP itself may not carry the risk of the increased perinatal mortality, neonatal morbidity, as well as cesarean section rate. The differences obtained in this study were obviously influenced by a higher induction of labor rate in PTP. This group was also more frequently monitored which can result in a higher incidence of the abnormal tests for fetal well-being. It would be interesting to see in how many of the cases the fetal compromise is diagnosed based on the same tests of fetal well-being if they were so frequently performed in the term group of patients.

Based on the results of this study, we believe that an expanded case-control study on normal spontaneous labor in post-term and term group of patients needs to be performed. If normal monitoring and normal onset of labor occurs there will be no added risk in the post-term pregnancy.

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Outcome of post-term pregnancy: A matched-pair case-control study. Article. Jan 1999. Croat med j. Ratko Matijevic. Matched-case control study was performed to assess perinatal mortality and feto-maternal morbidity related to the post-term pregnancy. 124 patients who delivered after 42 weeks of pregnancy were matched by age and parity with a control group of patients who delivered at term. Perinatal mortality and neonatal morbidity, as well as maternal morbidity were analyzed in both groups and differences tested for statistical significance. The purpose of this study was to evaluate the neonatal outcome in newborns from mothers with post-term pregnancy and vaginal prostaglandin (Prostin E2) for cervical ripening and labor induction. Case-Control Study. Steps, Selection of cases and controls, Matching, Measurement of exposure, Analysis and interpretation, Advantages, Disadvantages. By definition, a case-control study is always retrospective because it starts with an outcome then traces back to investigate exposures. When the subjects are enrolled in their respective groups, the outcome of each subject is already known by the investigator. This, and not the fact that the investigator usually makes use of previously collected data, is what makes case-control studies "retrospective". Case-control studies are not useful for determining the spectrum of health outcomes resulting from specific exposures, because a definition of a case is required in order to do a case-control study. References.