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Systematic Induction at 41 Weeks of Pregnancy: Are We Right? Clinical Experience and Literature Review

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Abstract

Objective: To evaluate the results of the systematic induction of prolonged pregnancies. **Material and Method:** We conducted an observational and analytical study on a retrospective cohort of 9 years: from January 1, 2010 to December 31, 2019 at the Philippe Maguilen Senghor Health Center, including all patients with a pregnancy of 41 weeks or more. **Results:** The analysis of the results highlighted: no increase in maternal complications (caesarean section, instrumental extraction), the neonatal prognosis in terms of morbidity (macrosomia, pH, hospitalization in neonatology, meconium inhalation) seemed slightly decreased compared to the literature. **Conclusion:** At the end of this work, we observe that the protocol used does not lead to an increase in maternal and perinatal morbidity.

Keywords

Prolonged Pregnancy, Expired Term, Perinatal Morbidity

1. Introduction

The average length of gestation is between 280 and 290 days from the first day of the last menstrual period, 40 + 0 weeks of gestation and 41 + 3 weeks of amenorrhea (WA) [1]. Prolonged pregnancy is defined as a term greater than or equal to 41 + 0 WA and the term exceeded by a term greater than or equal to 42 + 0 WA [1]. In 2016 in France, these two situations accounted for 16.8% and 0.5% of pregnancies, respectively [2]. This period requires special monitoring because raw neonatal and maternal morbidity and mortality increase gradually from 40 weeks of gestation [3]. At the fetal level, there is a five-fold higher risk of macrosomia, oligoamnios (10% - 15%), fetal heart rhythm abnormalities and fetal death in utero

(MFIU) [4]. These events are associated with more frequent neonatal complications such as meconium inhalation syndrome, sepsis, hypoglycemia, polycythemia, and neurological complications, warranting more ICU transfers [4]. At the maternal level, there is a moderate increase in the risk of caesarean section, postpartum hemorrhage, intrauterine infection and obstetric lesion of the anal sphincter (LOSA) [5]. Prolonged pregnancy is not a recent concept, but its management has evolved a lot, still raising many questions among professionals. Indeed, there is a great diversity in the protocols for monitoring these pregnancies depending on the establishment. This is why we were interested in evaluating the protocol for the management of these pregnancies in our maternity ward. The main objective of this study was to evaluate the outcomes of the systematic induction of prolonged pregnancies. We will then analyze the studies and trials validating this practice.

2. Methodology

We had conducted an observational and analytical study on a retrospective cohort of 9 years: from January 1, 2010 to December 31, 2019 at the Philippe Maguilen Senghor Health Center. The study included all patients admitted to the maternity ward with a pregnancy of 41 weeks or more. Women who received for premature delivery were not included. Through this study, we will study the perinatal and maternal morbidity of prolonged pregnancies and we will try to observe whether our treatment protocol seems appropriate and whether it does not induce greater morbidity compared to the literature. The parameters were entered into a computerized database called ePerinatal. The data were recorded daily during on-call shifts. The analysis was carried out using the statistical software RStudio 4.3.3 and the Social Package for Social Sciences (SPSS) version 26. We compared three groups: group 1 represented deliveries between 37 and 41 weeks of gestation, and thus served as the reference variable. Groups 2 and 3 respectively were concerned with prolonged pregnancies and post-term pregnancies. In univariate analysis, we described qualitative variables using frequency tables or charts. Quantitative variables were described by their measures of central tendency and dispersion. We looked for an association between different variables and the term of pregnancy through a bivariate analysis. Statistical tests were used according to their applicability conditions. The risk of a type I error (alpha) was set at 5% and the confidence interval (CI) at 95%. We excluded from the sample pregnancies for which a precise dating could not be made. These were women who did not have an early ultrasound performed in the first trimester of pregnancy. The same was true for those who did not have an exact memory of the date of their last menstrual period and/or had an irregular menstrual cycle.

❖ Operational definitions

- Date of last menstrual period: This is the date of the first day of the last menstrual period.
- Full-term pregnancy: Gestational age is calculated in completed weeks of amen-

orrhea. Labor is considered full-term when it occurs between 37 and 41 weeks of amenorrhea.

- Post-term pregnancy: It is defined as a pregnancy between 41 + 0 weeks and 42 weeks of amenorrhea.
- Beyond term: This refers to a pregnancy progressing beyond 42 completed weeks of amenorrhea.
- Artificial induction of labor: This corresponds to an artificial induction (mechanical or pharmacological) of uterine contractions resulting in cervical dilation, with the aim of achieving vaginal delivery.
- Elective cesarean section: Cesarean performed before the onset of labor.
- Acute fetal distress (AFD): the diagnosis of acute fetal distress was established in the presence of an abnormal fetal heart rate (FHR) on intermittent auscultation (less than 110 bpm or more than 160 bpm) associated with a stained amniotic fluid.
- Fetal macrosomia: It is defined by a birth weight greater than 4000 g or above the 90th percentile.
- Small for gestational age: It is defined by a birth weight less than 2500 g or below the 10th percentile.

3. Results

3.1. Incidence

From 2010 to 2019, 50,956 women gave birth at the Philippe Maguilen Senghor Health Center. Among them, 20,535 knew the exact date of their last menstrual period (LMP) or had an early ultrasound for the calculation of gestational age. The inclusion criteria were applicable to 18,871 patients, constituting the sample of this study. The incidence of pregnancies beyond term was 8.3%, and that of prolonged pregnancy was 14% (Figure 1 and Table 1).

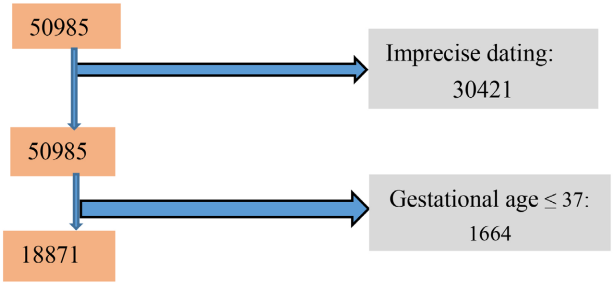

Figure 1. Flowchart of the patients included in the study.

Table 1. Distribution of patients according to the term of pregnancy.

Term (WA)	Number (n)	Percentage (%)
41 - 41 WA + 6 days	2647	14
≥42 WA	1572	8.3

WA = Weeks of amenorrhea.

3.2. Sociodemographic Characteristics and Medical History

The average age of the patients was 27.61 years with a standard deviation of 6.2. The median age was 27 years, with a range from 13 to 50 years. The average body mass index (BMI) of the parturients was 26.5 kg/m^2 with a standard deviation of 5.09. Half of the patients had a BMI above 25.7 kg/m^2. The average parity was 1.21 with a standard deviation of 1.5. Nulliparous women accounted for 43.8% of the sample. Nearly one in five patients was admitted following a referral from another healthcare facility (Table 2).

Table 2. Sociodemographic data.

Terms	Mean ± Standard Deviation	Median	Number (n)	Percentage (%)
Age (years)	27.6 ± 6.2	27		
Parity	1.2 ± 1.5			
Body Mass Index (kg/m^2)	26.5 ± 5.1	25.7		
Transfert			3601	19.1

3.3. Neonatal Data

Table 3. Measures of association between prolongation of pregnancy and neonatal outcome.

Statistics / Term (WA)	Percentage (%)	Odds Ratio	95% CI	p-value
Oligoamnios				
41 ≤ **1** < 42	0.6	1.5	[0.87, 2.73]	0.140
2 ≥ 42	1.0	2.60	[1.47, 4.63]	0.001
Macrosomia				
41 ≤ **1** < 42	9	2.05	[1.75, 2.39]	0.000
2 ≥ 42	9.6	2.20	[1.82, 2.64]	0.000
Apgar score less than 7 at the 5th minute				
41 ≤ **1** < 42	6.6	1.44	[1.15, 1.82]	0.002
2 ≥ 42	9.3	2.40	[1.89, 3.04]	0.000
Transfer to the neonatology department				
41 ≤ **1** < 42	1.3	1.17	[0.81, 1.70]	0.406
2 ≥ 42	2	1.87	[1.28, 2.74]	0.001
Small for gestational age				
41 ≤ **1** < 42	4.5	0.99	[0.99, 1.00]	0.001
2 ≥ 42	5	0.99	[0.99, 1.00]	0.002
Neonatal death				
41 ≤ **1** < 42	0.2	1.26	[0.48, 3.33]	0.643
2 ≥ 42	0.8	5.2	[2.53, 10.35]	0.000

WA = Weeks of amenorrhea. **1**: Group of patients with prolonged pregnancy. **2**: Group of patients past their due date.

During prolonged pregnancies, we observe a small increase in the Apgar score rate below 7 at the 5th minute. In addition, there was no difference in the rates of oligoamnios, transfer to the neonatal unit, and neonatal death.

On the other hand, post-term mortality is significantly associated with an increase in fetal and neonatal morbidity and mortality. We report a high risk of oligoamnios (OR = 2.60; 95% CI = [1.47, 4.63]), low Apgar score at the 5th minute (OR = 2.40; 95% CI = [1.89, 3.04]), transfer to the neonatal unit (OR = 1.87; 95% CI = [1.28, 2.74]) and neonatal death (OR = 5.12; 95% CI = [2.53, 10.35]) (Table 3).

3.4. Maternal Data

We observed an even greater risk when it came to over-term: OR = 2.12, 95% CI = [1.81, 2.50]. In both situations, the differences were statistically significant. The risk of post-partum hemorrhage was significantly higher in post-term pregnancies: OR = 2.85, 95% CI = [1.65, 4.92]. This risk did not apply to prolonged pregnancies. The risk of elective caesarean section was not greater in the case of post-term pregnancy, when this group was compared to full-term pregnancies. On the other hand, the risk of induction of labor was significantly greater for prolonged pregnancies and those beyond term. The ROs were 1.83 (95% CI = [1.53, 2.20]) and 5.27 (95% CI = [4.50, 6.20]), respectively. The risk of caesarean delivery was significantly no greater than in the post-term group: OR = 1.47, 95% CI = [1.32, 1.64] (Table 4).

Table 4. Measures of association between prolongation of pregnancy and maternal and obstetric parameters.

Statistics Term (WA)	Percentage (%)	Odds Ratio	95% CI	p-value
Premature rupture of membranes				
41 ≤ **1** < 42	9.2	1.206	[1.04, 1.40]	0.011
2 ≥ 42	7.1	0.902	[0.74, 1.10]	0.319
Cesarian pre-labor caesarean section				
41 ≤ **1** < 42	4.0	0.64	[0.52, 0.78]	0.000
2 ≥ 42	7.3	1.20	[1.0, 1.46]	0.083
Induction of labor				
41 ≤ **1** < 42	6.3	1.83	[1.53, 2.20]	0.000
2 ≥ 42	16.2	5.27	[4.50, 6.20]	0.000
Caesarean				
41 ≤ **1** < 42	27.8	1.03	[0.94, 1.13]	0.494
2 ≥ 42	35.4	1.47	[1.32, 1.64]	0.000
Post-partum hemorrhage				
41 ≤ **1** < 42	0.5	1.19	[0.63, 2.22]	0.591
2 ≥ 42	1.1	2.85	[1.65, 4.92]	0.000

WA = Weeks of amenorrhea. **1**: Group of patients with prolonged pregnancy. **2**: Group of patients past their due date.

4. Discussion

4.1. Weaknesses and Strengths of the Study

One of the main limitations of our study remains its retrospective nature. Furthermore, less than half of the patients who gave birth in the facility during these 9 years had an accurate dating of their pregnancy. The level of the technical facilities did not allow for recording fetal heart rate, hydrogen potential (pH), or lactate measurement from the fetal scalp. Thus, the diagnosis of peripartum asphyxia was made based on an Apgar score at the 5th minute of less than 7/10. The strengths of this study lie in the sample size as well as the method of data collection through a database.

4.2. Perinatal Asphyxia and Meconium Inhalation

For pregnancies beyond term, the diagnosis of AFS was more frequently made, with a prevalence of 13.2% compared to prolonged and full-term pregnancies. For the latter, the rates were 9.9% and 6.7% respectively. The difference was statistically significant (p = 0.000). Acute fetal hypoxia has a major role in the increase in perinatal mortality from 40 weeks of gestation. Olesen *et al.* [6] conclude that the risk of perinatal asphyxia is greater in post-term newborns (1.5%) than in term neonates (0.9%) with an OR calculated at 1.63 (95% CI = [1.43, 1.85]). The risk is increased in low birth weight infants with an OR = 2.91 [6]. Hovi *et al.* [7] conclude that 3.4% of post-term newborns have perinatal asphyxia compared to 2.1% of term newborns, with an OR of 1.47 (95% CI = [1.11, 1.95]). The fetus, exposed to a risk of hypoxia, undergoes a less efficient blood redistribution mechanism, degrading its renal function and consequently responsible for oligoamnios, which is common in post-mature newborns (15% - 20% of cases) [8]. By comparing full-term pregnancies with those beyond term, we found that the rate of oligoamnios (0.4% and 1% respectively) and transfer to neonatology (1.1% and 2% respectively) doubled beyond 42 weeks of pregnancy. We noted, for these 2 parameters, that prolonged pregnancy was not associated with an increase in morbidity.

Regarding pH at birth, Olosen *et al.* [6] found a neonatal asphyxia rate of 2.4%. However, in our data collection, we did not perform a pH assay. In our study, a proportion of 1.2% of newborns were transferred to the neonatal unit.

4.3. Perinatal Mortality

We have not observed any perinatal deaths, however, we find in the literature a significant increase in the relative risk of fetal death in the case of prolonged pregnancy: RR = 1 - 40 weeks, RR = 1.5 - 41 weeks, RR = 1.8 - 42 weeks, and RR = 2.5 - 43 weeks [9].

It is recognized that pregnancies that evolve beyond term lead to an increase in the risk of perinatal mortality, which increases from 0.7‰ to 5.8‰ between 37 and 40 weeks of gestation [7]. According to Olesen *et al.*, perinatal mortality is higher in post-mature newborns than in full-term newborns: OR = 1.36 (95% CI = [1.08,

1.72]) [6].

In a Swedish cohort study based on a national registry, Divon *et al.* [10] reported an increased risk of fetal death in utero as soon as pregnancy reached 41 WA (OR = 1.48; 95% CI = [1.13, 1.95]). At 43 weeks, this risk is almost multiplied by 3 (OR = 2.90; 95% CI = [1.27, 6.61]) [10].

4.4. Maternal Consequences

In our study, the rate of caesarean section performed before any onset of labor was lower in the case of prolonged pregnancy (4%) than in women at term or post-term (6.2% and 7.3% respectively). For the latter 2 groups, the difference in caesarean section rates was not significant (post-hoc: 2 < 1 = 3). Regarding the caesarean section rate in general, the prognosis was similar in women who gave birth at term and those who gave birth between 41 and 42 weeks of pregnancy. On the other hand, in cases of post-term, the rate of caesarean section was significantly higher, affecting more than 35% of women in this group (p = 0.000). It was noted, for example, that there was a wait-and-see attitude towards prolonged pregnancy, with an increase in caesarean section rates in the event of overterm pregnancy.

In the event of post-term hemorrhage, the rate of post-partum hemorrhage was multiplied by 2, with a significant difference with the other groups (p = 0.000). Maternal morbidity was therefore linked to obstetric interventions but also to serious direct complications.

Sanchez-Ramos *et al.*'s meta-analysis [11] also concludes that there is a lower rate of caesarean section in the case of a systematic induction policy at 41 weeks compared to simple monitoring. However, there were no significant differences in perinatal mortality, ICU admission, meconium inhalation and APGAR scores between the two populations. Indeed, these authors showed, over a period of nine years, a decrease in the proportion of newborns with meconium inhalation syndrome in their facility, well correlated with the decrease in post-term pregnancies over the same time interval. According to the French National Health Authority HAS [4], it is recommended to initiate fetal monitoring every 48 hours if the patient has not given birth at 41 weeks + 0 days. In the absence of delivery at 41 weeks + 6 days, it is recommended to induce labor. Induction at 41 + 0 days can be performed if the cervix is favorable after informing the patient and obtaining her consent, this attitude may be motivated by an impossibility of regular monitoring, a request from the patient or a need to organize care. The systematic review by Crowley [8] in 2006 concluded that a policy of induction of labor at or beyond 41 weeks is associated with a reduction in perinatal mortality, and in the number of newborns with meconium inhalation syndrome, and recommends a policy of induction of labor at 41 weeks. In a meta-analysis of 19 trials from 2006, Crowley [8] noted that after induction of labor, the rates of caesarean section and instrumental extraction remained close to those of spontaneous delivery in a prolonged pregnancy population. Similarly, Gelisen *et al.* [3] and Mozurkewich *et al.* [12] observed in a randomized study for the first and a meta-analysis for the second,

that induction of labor at 41 weeks of gestation did not increase the rate of caesarean section, slightly reducing neonatal morbidity compared to follow-up up to 42 weeks.

5. Conclusion

Prolonged pregnancies and outdated terms are obstetrical situations that raise questions about neonatal outcome. Treatment is then implemented to prevent complications related to a late term. Even if to date, no typical management of prolonged pregnancies has demonstrated its superiority in terms of maternal and perinatal benefits, it would seem that the one practiced in our department does not increase the maternal and perinatal consequences over the period studied. The increase in fetal and neonatal morbidity and mortality, recognized in our study and confirmed by almost all studies, requires an interventionist attitude as early as possible, as early as 41 weeks. Positive results in maternal and neonatal morbidities would prompt centres to modify their protocols in order to save resources and respect the physiology of labor. These results have led to the recommendation in our center and in many countries to induce labor when the pregnancy reaches 41 weeks. These recommendations are often well accepted by couples, as fatigue and anxiety increase as time passes.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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