

# THE EFFECT OF FOLEY CATHETER PREINDUCTION ON THE BIRTH STATE OF A NEWBORN COMPARED TO A SPONTANEOUS BIRTH

## WPLYW PREINDUKCJI CEWNIKIEM FOLEYA NA STAN URODZENIOWY NOWORODKA W PORÓWNANIU Z PORODEM SAMOISTNYM

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### ABSTRACT

**Aim.** The aim of the study was to analyze the birth status of a newborn after a childbirth induced by a Foley catheter compared to a spontaneous birth.

**Material and methods.** The study involved 146 newborns after spontaneous deliveries (47.9%) or induced by a Foley catheter (52.1%). The research methodology assumed the analysis of medical records. The calculations were carried out using the Statistica v 10.0 software from StatSoft. The Chi square Pearson and t-Student tests were used for statistical analysis. The significance level was assumed to be  $p \leq 0.05$ .

**Results.** The most common indications for the Foley catheter pre-induction were pregnancy after term, gestational type 1 diabetes and oligohydramnios. The neonatal birth rate assessed according to the Apgar scale did not differ significantly in both groups. Differences in the values of umbilical blood gasometry parameters in both groups were not statistically significant.

**Conclusions.** Induction of delivery with the Foley catheter is not associated with a worse birth condition of the newborn. The birth state of the newborn may also be dependent on pre-induction indications. The anthropometric parameters of the born fetuses, the Apgar score as well as the gasometric tests indicate that the Foley catheter can be considered as a cheap, but above all a safe and effective method of labor induction.

**KEYWORDS:** Scores on the Apgar's scale, umbilical cord blood gasometry, childbirth, induction of labor, Foley's catheter.

### STRESZCZENIE

**Cel.** Celem pracy była analiza stanu urodzeniowego noworodka po porodzie indukowanym cewnikiem Foleya w porównaniu do porodu samoistnego.

**Materiał i metody.** Badaniu poddano 146 noworodków po porodach samoistnych (47,9%) lub indukowanych cewnikiem Foleya (52,1%). Metodyka badań zakładała analizę dokumentacji medycznej. Obliczenia wykonano przy pomocy oprogramowania Statistica v 10.0 firmy StatSoft. Do analizy statystycznej użyto testu Chi kwadrat Pearsona oraz t-Studenta. Za poziom istotności przyjęto  $p \leq 0,05$ .

**Wyniki.** Najczęstszymi wskazaniami do preindukcji cewnikiem Foleya były ciąża po terminie, cukrzyca ciążowa typu 1 oraz małowodzie. Stan urodzeniowy noworodków oceniany według skali Apgar nie różnił się istotnie statystycznie w obu grupach. Różnice w wartościach parametrów gazometrii krwi pępowinowej w obu grupach nie były istotne statystycznie.

**Wnioski.** Indukcja porodu cewnikiem Foleya nie wiąże się z gorszym stanem urodzeniowym noworodka. Stan urodzeniowy noworodka może także być uzależniony od wskazań do preindukcji. Parametry antropometryczne urodzonych płodów, punktacja w skali Apgar, jak i badania gazometryczne wskazują, że cewnik Foleya można uznać za tanią, ale przede wszystkim bezpieczną i skuteczną metodę indukcji porodu.

**SŁOWA KLUCZOWE:** punktacja w skali Apgar, gazometria krwi pępowinowej, poród, indukcja porodu, cewnik Foleya.

### Introduction

One of the main goals of modern obstetrics is to provide a pregnant successful motherhood. New standards of care introduced in gynecology and midwifery departments result in an increase in the safety of the mother,

fetus and newborn. The introduction of antenatal fetal surveillance contributes to early diagnosis of risks, selection of the optimal time and manner of termination of pregnancy and avoiding unnecessary interventions [1]. The rationale behind the use of induction is the reduc-

tion of mortality and perinatal morbidity of the fetus and newborn as well as the minimization of maternal complications [2]. At present, every fifth pregnant woman is induced at birth, and 30–40% in the group giving birth naturally [3].

Induction of childbirth is carried out with pharmacological methods (prostaglandins E2 and E1, oxytocin) and/or mechanical (Foley catheter, Cook, amniotomy) [4]. The effectiveness of preinduction and induction of labor depends on the duration of pregnancy, fertility and maturity of the cervix, but for parents the most important is the birth of a healthy child, hence the choice of the appropriate method of terminating pregnancy should be dictated by the good of the mother and the child [5]. The analyzes conducted so far focused mostly on data on delivery itself, hence our attempt to interpret the birth state of the fetus depending on the method of induction.

## Aim

The aim of the study was to analyze the birth status of a newborn after a childbirth induced by the Foley catheter compared to a spontaneous birth.

## Material and methods

The study involved 146 newborns after spontaneous or the Foley induced catheters. The births took place in the Department of Gynecology and Obstetrics of the Independent Public Health Care Center in Choszczno. The tests were carried out from 1st Jan 2018 to 1st Apr 2019. The study population was divided into a spontaneous group (n = 70, 47.9%) and the pre-induced Foley catheter (n = 76, 52.0%).

The calculations were carried out using the Stats Static software v 10.0 from Statsoft. The calculations are presented in the form of tables giving the size of a given quality feature and its percentage value. The Pearson Chi square test was used to assess the relationship, and the Student's t test to compare arithmetic means and continuous variables. The statistical significance was assumed to be  $p \leq 0.05$ .

## Results

**Table 1.** Data of studied population

	X	SD	Me	Min	Max
Age	27.6	5.4	27.5	17	45
Number of pregnancies	2.1	1.2	2	1	7
Parity	1.9	1.1	2	1	7
The duration of pregnancy [in weeks]	38.9	1.2	39	36	41
Neonates' body weight	3255	453	3320	2010	4300

X – mean, SD – standard deviation, Me – median, Min – minimum, Max – maximum

Source: author's own analysis

The average duration of pregnancy was  $38.9 \pm 1.2$  weeks. The average age of patients was  $27.6 \pm 5.4$  years. The results are shown in **Table 1**.

**Table 2.** Data on the course of labor

	Spontaneous delivery		Foley catheter-induced labor		p*
	X	SD	X	SD	
Total duration of labor [min]	270.3	183.5	224.4	117.8	0.263
The time from amniotomy to delivery [min]	170.7	274.8	514.2	491.5	0.002
The total time from rupture of fetal membranes to delivery [min]	253	338	209.2	180.5	0.451

\* t-student's test

Source: author's own analysis

The average time from breakthrough of the fetal water to delivery was  $170.7 \pm 274.8$  min in the group of spontaneous deliveries and  $514.2 \pm 491.5$  min in deliveries induced by the Foley catheter. The differences were statistically significant ( $p = 0.002$ ). Data are presented in **Table 2**.

**Table 3.** Indications for preinduction

	Total		Foley catheter-induced Labour	
	n	%	n	%
Oligohydramnion	21	14.4	19	25
Polihydramnion	4	2.7	3	3.9
Gestational diabetes type 1	24	16.4	20	26.3
Gestational diabetes type 2	13	8.9	13	17.1
Intrauterine Growth Retardation	3	2.1	3	3.9
Pregnancy after due date	25	17.1	25	32.9
Pregnancy induced hypertension	11	7.5	11	14.5

Source: author's own analysis

Indications for preinduction with the Foley catheter were from the most common: pregnancy after term (32.9%), gestational diabetes type 1 (26.3%), oligohydramnios (25%), gestational diabetes type 2 (17.1%), gestational hypertension (14.5%), polyhydramnios (3.9%) and IUGR (3.9%). The results are presented in **Table 3**.

**Table 4.** Diseases during pregnancy

	Spontaneous delivery		Foley catheter-induced labour		Total		p*
	n	%	n	%	n	%	
Pregnancy induced hypertension	0	0	11	14.5	11	7.5	0.1
Preeclampsia	0	0	1	1.3	1	0.7	
Gestational diabetes type 1	3	4.3	20	26.3	23	15.8	0.004
Gestational diabetes type 2	2	2.9	5	6.6	7	4.8	
Intrauterine Growth Retardation	1	1.4	1	1.3	2	1.4	0.243
Cholestasis	0	0	3	3.9	3	2.1	0.244
Anaemia	3	4.3	2	2.6	5	3.4	0.582
Hypothyroidism	5	7.1	4	5.3	9	6.2	0.637
Incompatibility in the Rh factor	9	12.9	12	15.8	21	14.4	0.614

\* Chi-square Pearson's test

Source: author's own analysis

In the group of labor induced by the Foley catheter pregnant women with gestational diabetes significantly more often ( $p = 0.0004$ ). The occurrence of other diseases did not show statistically significant differences. The results are presented in **Table 4**.

**Table 5.** Anthropometric data of the newborn

	Spontaneous delivery		Foley catheter-induced Labour		p*
	X	SD	X	SD	
Neonates' body weight	3290	438.5	3253	441	0.614
Embryo's length	54.8	3.1	54.6	2.9	0.595
Chesty's circuit	33.1	1.7	33.1	1.8	0.896
Head's circuit	33.6	1.7	33.8	1.8	0.377

\* t-student's test

Source: author's own analysis

Anthropometric data of the newborn born after induction with the Foley catheter did not differ significantly in comparison to the one born spontaneously. The results are presented in **Table 5**.

**Table 6.** Birth state of the newborn determined on the basis of the Apgar score depending on the type of delivery

	Spontaneous delivery		Foley catheter-induced Labour		p*
	X	SD	X	SD	
In first minute [points]	9.7	0.5	9.6	0.8	0.258
In third minute [points]	9.9	0.3	9.8	0.6	0.377
In fifth minute [points]	9.9	0.1	9.9	0.4	0.22

\* t-student's test

Source: author's own analysis

The birth status of all newborns was graded according to the Apgar scale in turn at 1,3,5 minutes. There was no statistically significant difference in the assessment of the newborn's condition. The results are presented in **Table 6**.

**Table 7.** Gasometry of umbilical cord blood of newborns

	Spontaneous delivery		Foley catheter-induced Labour		p*
	X	SD	X	SD	
pH	7.36	0.07	7.35	0.06	0.747
pCO <sub>2</sub>	38.7	9.7	39	8.4	0.857
pO <sub>2</sub>	24.3	7.8	23.6	6.9	0.579
HCO <sub>3</sub>	20.5	2.5	20.9	2.9	0.36
tCo <sub>2</sub>	18.7	5.3	18	4.2	0.353
BE	-1.9	12.7	-3.4	2.2	0.311
O <sub>2</sub>	43.2	21.7	38.9	17	0.182

\* t-student's test

Source: author's own analysis

Differences in individual parameters of fetal gasometry were not statistically significant depending on the type of delivery. The results are listed in **Table 7**.

## Discussion

In Patro-Malysza's studies, the condition of newborns born after the Foley's catheter pre-induction was good, 94.8% of newborns received 8 and more Apgar points in the 3rd minute, which gave an average score of 9.48 [5]. In Jagielska et al. [6], the average Apgar score was  $9.5 \pm 0.80$ , mean umbilical cord blood pH  $7.3 \pm 0.08$ , and the average birth weight of newborns  $3392 \pm 644,72$  g. In the studies of K. Kosińska-Kaczyńska et al. [7] the state of newborns in the first minute mostly oscillated around 8-10 points, and in the 5th minute all newborns in the induced group and 98.9% in the control group were in a good general condition. In the studies of Prager et al. [8] comparing dinoprostone induction with misoprostol induction and Foley catheter induction, the neonatal majority was good, the average Apgar score was 9.6 for the Foley catheter, and umbilical cord pH 7.26. The results in comparison with the induced pharmacological agents did not differ significantly in statistics [8]. In our studies, no statistically significant differences were observed in the anthropometric data of newborns. Newborns in both groups were born in a good birth state. The average birth weight of newborns in spontaneous deliveries was  $3290 \pm 438.5$ g and in fetal induced catheters  $3253 \pm 441$ g.

Sometimes the authors suggest that the birth status of newborns after induced births is dependent on

indications for the induction of labor. In the studies of Jagielska et al. [6], the most common indication was pregnancy after term, in Patro- Małysz reduced fetal biophysical profile and pregnancy after delivery [5, 6]. In our studies, the most common induction was due to: late pregnancy, first type gestational diabetes and oligohydramnios. Dunne et al. [9], studying the methods of delivery, stated that the risk of sudden caesarean section is almost three times higher in the case of induction of labor. In other studies, the percentage of births by births amounted to 69.4–72.17% of cases, and the most common indication for caesarean section (CC) was intrauterine fetal distress threatening [5, 6].

In turn, Pennel et al. [10] analyzed the validity of elective caesarean section in the case of risk factors of labor induction and found that there is insufficient evidence pointing to the benefits of elective caesarean section compared to induction of labor. The issue is taken up by Józwiak et al. [11] focuses on the use of oxytocin in induction. In their studies, they found that oxytocin was significantly more frequently used in the group of mechanical methods (96% vs. 66%). An interesting modification of the induction using mechanical methods is the use of a the Foley catheter with a load, in the studies of Baczyńska et al. [12], which significantly shortened the time of labor induction and amounted to  $265.9 \pm 158.8$  min.

One of the main arguments against the use of the Foley catheter is the increased risk of infection in both the fetus and the mother. Dalui et al. [13] stated that the use of the Foley catheter does not cause significant changes in the bacterial flora. In 94% of patients no complications were observed, and the temperature above 38°C was observed only in 0.9% of the subjects. In the Petro-Małysza study, 94% of patients did not experience complications [5]. In Jagielska et al. [6] studies an increase in CRP concentration in the maternity was observed, however, it was the normal range for pregnant women (< 12 mg/l). In the studies of other authors, the results were comparable, which indicates high safety associated with the use of the Foley catheter [14, 15]. In turn, Mozourkewich et al. [16] in their study found that induction with the Foley catheter reduces the risk of surgical deliveries, including caesarean section, but simultaneously it is associated with an increased risk of infection in mothers and newborns. Our research also did not show an increased risk of infection in children born after induction with a Foley catheter, which could be indirectly inferred from the birth state of the fetus, the time of hospitalization of newborns and the results of gasometry. Mierzwa et al. [17] did not observe statistically significant relationship between the methods used and the incidence of complications in particular periods

of delivery in the mother, the way of finishing pregnancy and the condition of the newborn immediately after delivery. The authors indicate that pre-induction and induction of labor using selected methods are effective for inducing labor and to a similar extent safe for the mother and the child [17, 18].

## Conclusions

Induction of delivery with the Foley catheter is not associated with a worse birth condition of the newborn. The birth state of the newborn may also be dependent on pre-induction indications. The anthropometric parameters of the born fetuses, the Apgar score as well as the gasometric tests indicate that the Foley catheter can be considered as a cheap, but above all safe and effective method of labor induction.

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