Original paper

Classification of labor induction according to the Grenoble and Nippita systems. A cross-sectional and comparative study

Klasyfikacja indukcji porodu według systemów Grenoble oraz Nippita. Badanie przekrojowe i porównawcze

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Słowa kluczowe: indukcja porodu, klasyfikacja Nippita, klasyfikacja Grenoble.

Abstract

Introduction: Labor induction (IOL) is a prevalent procedure that plays a significant role in reducing maternal and neonatal morbidity and mortality. One of the essential aspects of this process is the standardization of IOL procedures, which aids in the systematic analysis of outcomes. Currently, the most widely used system for this purpose is the Nippita classification (NC). However, there is a newly proposed system, the Grenoble classification (GC) that is aimed at an innovative standardization system.
Aim of the research: The main objective of this study is to draw a comprehensive comparison between the categorization of IOL procedures under the existing NC and the newly proposed GC system.
Material and methods: Our study was carried out in a third-level center in Poland, where we observed a sample of 819 patients who underwent IOL. We considered common indications for IOL, including post-term pregnancy, premature rupture of membranes, and gestational diabetes.
Results: Upon comparing the NC and GC, we found significant differences in the distribution of patients among various categories. The most commonly observed categories were N3 and G5 in NC and GC, respectively (33.3% and 51.64%). Additionally, differences were identified in the proportion of patients who underwent cesarean section across homogeneous categories in both systems.
Conclusions: The insights derived from this study suggest that the GC may provide a more suitable framework for standardizing IOL procedures as it accounts for additional obstetric criteria. Implementing a universal classification system for IOL could enhance outcome monitoring capabilities and foster the development of perinatal care worldwide.

Streszczenie

Wprowadzenie: Indukcja porodu (IOL) to powszechna procedura, która odgrywa istotną rolę w redukcji zachorowalności i śmiertelności matek i noworodków. Jednym z kluczowych aspektów tego procesu jest standaryzacja procedur IOL, która umożliwia systematyczną analizę wyników. Obecnie najczęściej używanym systemem do tego celu jest klasyfikacja Nippita (NC). W piśmiennictwie opisano ostatnio klasyfikację Grenoble (GC), która dąży do innowacyjnego systemu standaryzacji.
Cel pracy: Głównym celem badania jest przeprowadzenie porównania między kategoryzacjami procedur IOL pod kątem istniejącego systemu NC i nowo zaproponowanego systemu GC.
Materiał i metody: Badanie przeprowadzono w Klinice Położnictwa i Ginekologii Wojewódzkiego Szpitala Zespolonego w Kielcach, ośrodka trzeciego poziomu referencyjności w grupie obejmującej 819 pacjentek, które miały wskazania do IOL.
Wyniki: Po porównaniu NC i GC stwierdzono znaczne różnice w rozkładzie pacjentek wśród różnych kategorii. Najczęściej obserwowane kategorie to N3 i G5 odpowiednio w systemach NC i GC (33,3% i 51,64%). Dodatkowo zidentyfikowano różnice w proporcji pacjentek, u których poród zakończył się na drodze cięcia cesarskiego w jednorodnych kategoriach obu systemów.
Wnioski: Nowo opisana klasyfikacja Grenoble może zapewnić bardziej odpowiednią ramę dla standaryzacji procedur IOL, ponieważ uwzględnia nieistniejące w klasyfikacji Nippita kryteria położnicze. W artykule szczegółowo omówiono różnice w obu podejściach. Wdrożenie uniwersalnego systemu klasyfikacji IOL może zwiększyć możliwości monitorowania wyników i sprzyjać rozwojowi opieki okołoporodowej na świecie.

Introduction

Labor induction (IOL) is a procedure that is increasingly being performed worldwide [1], but the percentage of IOL varies significantly between countries [2]. The main goal of this procedure is to reduce the morbidity and mortality of mothers and newborns. IOL should be performed for strictly defined indications, which relate to individual pathologies affecting the pregnant woman and fetus as well as to the gestational age at which the benefit of completing the pregnancy is greater than the risk associated with its continuation. Local scientific societies' recommendations regarding these issues may differ significantly, and so far, no universal recommendations have been made to cover the issue comprehensively. Additionally, the course of the procedure can differ significantly between centers. These differences are particularly evident in the case of an immature cervix (usually assessed as < 7 points on the Bishop's scale), and many methods are used to prepare the cervix, such as prostaglandins, hygroscopic dilators, Foley catheters, etc. [3]. To properly monitor IOL procedures worldwide, to create databases for assessing perinatal complications, maternal and neonatal mortality and morbidity, and resource consumption, the first step should be an appropriate classification of such a procedure leading to the creation of homogeneous groups among which complications can be analyzed in large cohorts of patients.

So far, many classifications of IOL have been described in the literature [4]. These classifications have mainly been based on gestational age, parity, the number of fetuses in the uterus, and the presence of a scar after a previous cesarean section. Based on the literature data, it seems that the most commonly used classification so far has been the Nippita classification (NC) (Table 1) of 2015 [5]. However, none of them has become so widespread globally as to become the gold standard.

In 2015, WHO and FIGO recommended the implementation of the 10-group classification system (TGCS) by Robson to classify cesarean sections worldwide [6, 7]. Such implementation aimed to identify and analyze groups of women who contribute the most to the overall number of cesarean sections, compare practices worldwide to unify the approach in different regions of the world, analyze outcomes in individual groups, and increase personnel awareness of how important classified data are for the further development of perinatal care. This classification was based on five basic characteristics such as parity, the number of fetuses, previous cesarean section, onset of labor, gestational age, and fetal presentation.

In 2022, a team of French experts proposed a new classification of IOL based on the principles used in TGCS, i.e. the Grenoble classification (GC) (Table 2) [8]. The proposed classification is an 8-level easy-to-use classification based on five obstetrical criteria present in all medical records: the number of fetuses, the presentation of the fetus, the gestational age in weeks, the existence of prelabour rupture of membranes (PROM) at term, and the existence of maternal or fetal pathology.

Aim of the research

In our study, we decided to compare IOL categorized according to the Nippita classification of 2015 and the new Grenoble classification described in 2022 in a third-level center in Poland. This comparison was intended to have an educational and popularizing value for the classification of IOL. The aim was also to discuss the differences between the systems and the advantages that could result from a universal classification used worldwide, both for patients and healthcare systems.

Material and methods

It was a cross-sectional, retrospective study. The consent for the analysis was given by the bioethical

Table 1. Nippita classification

Nippita group number	Description
N1	Nulliparous, 37–38 weeks of gestation, single cephalic pregnancy
N2	Nulliparous, 39–40 weeks of gestation, single cephalic pregnancy
N3	Nulliparous, 41+ weeks of gestation, single cephalic pregnancy
N4	Multiparous, no previous caesarean section, 37–38 weeks of gestation, single cephalic pregnancy
N5	Multiparous, no previous cesarean section, 39–40 weeks of gestation, single cephalic pregnancy
N6	Multiparous, no previous cesarean section, 41+ weeks of gestation, single cephalic pregnancy
N7	No previous cesarean section, ≤ 36 weeks of gestation, single cephalic pregnancy
N8	Previous cesarean section, single cephalic pregnancy
N9	Single, non-cephalic pregnancy
N10	Multi-fetal pregnancy

Table 2. Grenoble categories with description

Grenoble group number	Description
G1	Multiple pregnancies
G2	Single breech pregnancy
G3	Preterm single cephalic pregnancy (term less than 37 weeks gestation)
G4	Single cephalic pregnancy with prelabour rupture of membranes at term (37 weeks gestation and above)
G5	Single cephalic pregnancy, late term and post term (41 weeks gestation and over), intact membranes
G6	Single cephalic pregnancy, term between 37 and 40 weeks, 6 days with maternal pathology indicating induction, intact membranes
G7	Single cephalic pregnancy, term between 37 and 40 weeks, 6 days with fetal pathology indicating induction, intact membranes
G8	Single cephalic pregnancy, term between 37 and 40 weeks, 6 days, induced without medical indication, intact membranes

Table 3. Classification of patients according to Nippita system

Nippita group	Share in all IOLs	CS (% of IOL group)	Apgar < 4	Apgar < 8	pH < 7.2	Prostaglandins usage
N1	12.6 %	36.89%	0%	12.62%	2.91%	32.04%
N2	13.5%	38.18%	0.91%	9.09%	4.59%	33.03%
N3	33.3%	44.49%	0%	3.69%	1.84%	24.44%
N4	8.2%	20.90%	0%	10.45%	3.03%	38.46%
N5	9.2%	6.67%	0%	0%	0%	26.67%
N6	18.6%	12.67%	0%	2.01%	0%	31.08%
N7	0.9%	25%	12.50%	12.50%	0%	75%
N8	3.7%	60%	0%	3.33%	3.33%	0%
N9	0%	0%	0%	0%	0%	0%
N10	0.24 %	50%	0%	0%	0%	0%

IOL – induction of labor, CS – cesarean section.

commission at the Jan Kochanowski University in Kielce (number of approval 3/21). All methods were performed in accordance with the relevant local regulations and guidelines of the bioethical commission. We reviewed all medical records of patients who gave birth at the Department of Obstetrics and Gynecology of the Provincial Combined Hospital in Kielce from January 2019 to September 2022, identifying patients who underwent labor induction. Based on the medical documentation, we classified the patients into the appropriate groups according to the Nippita and Grenoble classifications. Additionally, we assigned to each group the percentage of cesarean sections, the percentage of newborns born in a severely depressed state at 1 minute (Apgar < 4) and in a moderately to severely depressed state (Apgar < 8), the percentage of newborns born with pH < 7.2, and the percentage of patients who received preinduction prostaglandins during the induction process (prostaglandins used in our department were dinoprostone 10 mg in a vaginal insert released over 24 hours, misoprostol 200 micrograms in a vaginal insert released over 24 hours, and cervical gel with dinoprostone 0.5 mg/3 g).

Results

We included 819 patients in the study. The percentage of IOL in the Clinic was 15.9%. The cesarean delivery rate among patients undergoing IOL was 31.8%. The overall average cesarean delivery rate in the Clinic was 47% during the study period.

The results of the Nippita classification of IOL are presented in Table 3. The largest percentage of IOLs was performed in patients in their first pregnancy af-

Table 4. Classification of patients according to Grenoble system

Grenoble group	Share in all IOLs	CS (% of IOL group)	Apgar < 4	Apgar < 8	pH < 7.2	Prostaglandins usage
G1	0.3%	50%	0%	0	0%	0%
G2	0%	0%	0%	0%	0%	0%
G3	1.1%	28.57%	14.29%	14.29%	0%	71.43%
G4	5.2%	34.29%	0%	5.71%	0%	68.57%
G5	51.64%	33.84%	1.26%	3.30%	1.26%	24.49%
G6	22.6%	37.59%	0%	11.28%	5.26%	32.31%
G7	18.3%	31.46%	1.12%	8.99%	0%	29.97%
G8	0.9%	0%	0%	0.00%	0%	50%

ter 41st week of gestation (N3), with the second most common indication for induction being patients included in group N6. There were no patients classified as N9 because, according to local guidelines, breech presentation is a contraindication for IOL. The largest percentage of cesarean deliveries in our cohort was also found in the N3 group. Table 4 presents the Grenoble classification of IOL. The largest percentage of patients was classified as G5. Pregnancy after 41 weeks accounted for over half of the indications for IOL. The next most common indications were patients who underwent IOL due to maternal or fetal pathology (groups G6 and G7). IOL most often resulted in a cesarean delivery in twin pregnancies, but the absolute number of patients was low (two inductions, one cesarean delivery). The second highest percentage of cesarean deliveries was in patients with premature rupture of membranes (G4). The Grenoble classification clearly indicates that the group of patients in whom prostaglandins were most commonly used were in groups G3 and G4, which was likely due to a less favorable cervical status in preterm pregnancies and in cases of premature rupture of membranes. There were no problems with data misinterpretation or assigning patients to the correct groups during the classification process for both Nippita and Grenoble classifications.

Discussion

The presented results show two approaches to the IOL classification. When interpreting the data in the obtained tables from both classifications, we can draw slightly different conclusions. In the Nippita classification applied in our cohort, a picture of pregnancy after 41 weeks of gestation in nulliparous women emerges as the most frequent indication for IOL (N3). In the Grenoble classification, this group is also the most frequent, although treated collectively for nulliparous and multiparous women. The second largest group in GC was patients with term pregnancies with maternal indications for induction of labor. In interpreting the results, it should be taken into account that the study was conducted in a third-level center, and patients with medical maternal complications such as hypertension and diabetes are classified in group G6. These pregnancy complications are also the most common indications for IOL after post-term pregnancy in our center [9]. In Polish conditions, hypertension in pregnancy and diabetes are indications for its completion after 38 and 39 weeks of gestation, respectively, regardless of concomitant diseases [10]. Both classifications indicate that there are no patients in the center who are undergoing IOL with breech fetal position as this is a contraindication for this procedure according to Polish recommendations [10].

Therefore, both systems differ significantly in terms of the information they provide. From the Nippita classification, we can infer the exact gestational age in term pregnancy, parity, and previous cesarean section, and it also contains information about the fetal position (all breech positions are classified into category N9) and whether the pregnancy is multiple (all twin pregnancies are classified into category N10). However, in the case of a patient after a cesarean section (N8) and in multiple pregnancies (N10), other information is "lost" because they are not categorized according to gestational age, parity, and previous cesarean section.

The Nippita classification is not informative regarding indications for labor induction, although two categories may tell us about indications, namely N3 and N6 groups represent patients who have completed the 41st week of gestation. In the approach developed in GC, we know whether indications for IOL were maternal or fetal in pregnancies below 41 weeks of gestation (G6 and G7). Additionally, there is a separate category for patients induced after completing the 41st week of gestation, which is currently one of the most common indications for IOL worldwide. Therefore, by monitoring these categories (N3, N6, G5), we are able to partially assess the epidemiological implications of new recommendations for labor induction in selected pregnancy pathologies and newborns [11].

In GC, information about premature rupture of membranes (PROM) is also extremely important from a clinical point of view, mainly due to a different approach to the process of labor induction in terms of resources used (contraindication to the use of Foley catheter, ambiguous studies regarding the release of vaginal prostaglandins in the amniotic fluid environment, etc.) [12]. GC also leaves room for unclassified patients without strict indications for IOL, which sometimes happens in obstetric departments (social, psychological issues, distance from the delivery center, high-risk pregnancies, unfavorable obstetric history). However, GC does not inform us about the patient's parity, which is extremely important in terms of the effectiveness of labor induction (the percentage of cesarean sections is lower among multiparous women who undergo induction), nor about patients who undergo a trial of labor after cesarean section (TOLAC), which seems to be important in many countries in the era of the increasing epidemic of cesarean sections. It seems that due to the fact that both of these classification variables are dichotomous (cesarean section and multiparity), it would be easy to add two classification signs to each group if these issues were to arise from the tables (e.g., G6 mc – for multiparous women, after cesarean section).

The use of a universal classification for IOL would allow for better monitoring of the epidemiological response to new recommendations developed at national and international levels. A universal database would also allow for the analysis of mortality and morbidity in individual groups and monitoring of resources used for preinduction of labor. Creating such a database could also provide information on the best methods of preinduction of labor in individual groups (in order to minimize the percentage of cesarean sections while maintaining safety for the mother and newborn). This information is particularly important in the context of the increasing prevalence of IOL worldwide. In the United States, where the variable related to the share of IOL appears in national health registers, the percentage of induced deliveries increased from 9.5% in 2010 to 29.4% in 2019 [13]. This percentage will probably continue to rise as a result of the dissemination of the results of the ARRIVE study [14] and the current recommendations of the American College of Obstetricians and Gynecologists regarding possible elective induction of labor after completing the 39th week of gestation, which are a consequence of this work. With the introduction of such a procedure into clinical practice, the percentage of patients qualifying for N3 and N6 as well as G5 groups should decrease.

The dissemination of knowledge on IOL classification worldwide could bring many benefits in terms of epidemiological and scientific development. Having such information can serve to monitor the impact of local and global recommendations on trends in management in different countries. Additionally, observations of outcomes in specific homogeneous groups can provide feedback on the recommendations being created. In particular classification groups, we can observe neonatal and maternal results, which is especially important in the context of conflicting literature data on the risk of cesarean section in cases of induction of labor [14–16]. There is a high probability that this percentage may differ depending on the population being studied. With the widespread reporting of induction of labor according to the classification, this problem would be easier to solve because the classification allows for the observation of outcomes in homogeneous groups of patients.

So far, apart from pioneering work, we have not found any studies on IOL classification according to the Grenoble system. There are studies available that classify IOL according to the Nippita system and compare results between centers [5, 17]. However, for classification activities to be meaningful for the advancement of science and the enhancement of safety for mothers and children, they should be disseminated at both national and international levels, similar to the WHO recommendations on implementing TGCS.

The ideal classification is one that is not complex, easy to use, can be used retrospectively, and is maximally informative. In this regard, we believe that the newly developed Grenoble classification is better from a clinical point of view compared to the Nippita classification. The Grenoble classification has categories that are of dubious clinical usefulness (such as the separation of categories N1 and N2) and a lack of differentiation of patients with ruptured membranes.

Conclusions

Both classifications used for IOL are easy to use based solely on medical records. In our opinion, the Grenoble classification has greater clinical utility.

Data Availability Statement

The data that support the findings of this study are openly available in OSF Storage at DOI 10.17605/OSF.IO/3DV7X.

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Ethical approval

The consent for the analysis was given by the bioethical commission at the Jan Kochanowski University in Kielce (number of approval 3/21).

Conflict of interest

The authors declare no conflict of interest.

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