EDITORIAL

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Research Article

# AMNIOTIC FLUID IS A MARKER OF THE CONDITION OF THE FETUS. IS IT SO?

© Vitaly F. Bezhenar [1], Lidiia A. Ivanova [2], Dmitry O. Ivanov [3], Olga L. Krasnogorskaya [3]

[1] Academisian I.P. Pavlov First St. Petersburg State Medical University, Saint Petersburg, Russia;
[2] Kirov Military Medical Academy, Saint Petersburg, Russia;
[3] St. Petersburg State Pediatric Medical University, Saint Petersburg, Russia

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**BACKGROUND:** In the presence of meconium in the amniotic fluid, childbirth is usually classified as a high-risk group, which leads to an expansion of indications for operative delivery. Also in the literature there are indications of an increase in the frequency of the birth of a child in a state of asphyxia, with premature rupture of amniotic fluid.

**AIM:** The aim of this study is to determine the significance of the influence of meconium color of amniotic fluid and the duration of the anhydrous period on the birth of a child in a state of asphyxia.

**MATERIALS AND METHODS:** A retrospective study was conducted between the two groups in 12,342 women delivered at the Perinatal Center of the Pediatric University.

**RESULTS:** Meconium coloration of amniotic fluid was 2 times more common in the presence of hypoxia, and 5 times more common in the presence of severe fetal hypoxia during full-term pregnancy, while in premature pregnancy, the child was born in a state of asphyxia, regardless of the color of the amniotic fluid. Premature rupture of amniotic fluid occurred at the birth of a full-term baby in a state of asphyxia statistically significantly more often, although the duration of the anhydrous period did not have statistically significant differences in the groups.

**CONCLUSIONS:** Premature rupture of amniotic fluid at the birth of a premature baby had no differences in the groups with and without asphyxia, however, the duration of the anhydrous period was statistically significantly longer in patients who gave birth to children in a state of asphyxia. With an anhydrous interval of 26 hours or more, the risk of having a child in a state of moderate and severe asphyxia increased. The risk of ascending infection of the placenta of the third stage during preterm labor increased with an anhydrous interval of more than 53 minutes, which confirms the feasibility of prescribing antibiotic therapy for premature rupture of amniotic fluid during preterm pregnancy at the time of diagnosis of this condition, regardless of the planned obstetric tactics.

**Keywords:** pregnancy; infant, newborn; amniotic fluid; meconium; asphyxia; fetal hypoxia; placenta.

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# ОКОЛОПЛОДНЫЕ ВОДЫ – МАРКЕР СОСТОЯНИЯ ПЛОДА. ТАК ЛИ ЭТО?

© В.Ф. Беженарь [1], Л.А. Иванова [2], Д.О. Иванов [3], О.Л. Красногорская [3]

[1] Первый Санкт-Петербургский государственный медицинский университет им. акад. И.П. Павлова, Санкт-Петербург, Россия;

[2] Военно-медицинская академия им. С.М. Кирова, Санкт-Петербург, Россия;

[3] Санкт-Петербургский государственный педиатрический медицинский университет, Санкт-Петербург, Россия

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**Актуальность.** При наличии мекония в околоплодных водах роды обычно относят к группе высокого риска, что ведет к расширению показаний к оперативному родоразрешению. В литературе также есть указания на повышение частоты рождения ребенка в состоянии асфиксии, при преждевременном излитии околоплодных вод.

**Цель исследования** – определение значимости влияния мекониальной окраски околоплодных вод и длительности безводного промежутка на рождение ребенка в состоянии асфиксии.

**Материалы и методы.** Проведено ретроспективное исследование двух групп из 12 342 женщин, родоразрешенных в Перинатальном центре Педиатрического университета.

**Результаты.** Мекониальная окраска околоплодных вод в 2 раза чаще встречалась при наличии гипоксии и в 5 раз чаще – при наличии тяжелой гипоксии плода при доношенной беременности, тогда как при недоношенной беременности ребенок рождался в состоянии асфиксии вне зависимости от цвета околоплодных вод. Преждевременное излитие околоплодных вод встречалось при рождении доношенного ребенка в состоянии асфиксии статистически значимо чаще, хотя длительность безводного промежутка статистически значимых различий в группах не имела.

**Заключение.** Преждевременное излитие околоплодных вод при рождении недоношенного ребенка различий в группах при наличии и отсутствии асфиксии не имели, однако длительность безводного промежутка была статистически значимо больше у пациенток, родивших детей в состоянии асфиксии. При безводном промежутке 26 ч и более риск рождения ребенка в состоянии асфиксии средней и тяжелой степени увеличивался. Риск восходящего инфицирования последа третьей стадии при преждевременных родах повышался при длительности безводного промежутка более 53 мин, что подтверждает целесообразность назначения антибактериальной терапии при преждевременном излитии околоплодных вод при недоношенной беременности в момент диагностики данного состояния вне зависимости от планируемой акушерской тактики.

**Ключевые слова:** беременность; младенец, новорожденный; амниотическая жидкость; меконий; асфиксия; гипоксия плода; плацента.

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## BACKGROUND

The presence of meconium in the amniotic fluid is one of the possible symptoms of intrauterine fetal hypoxia. In 1903, Whitridge Williams [14] first noted that the release of meconium into the amniotic fluid was a consequence of anal sphincter relaxation against hypoxia. Later, in the presence of hypoxia, the fetus may exhibit abnormal respiratory movements, which, in the case of meconium-stained amniotic fluid, can lead to meconium aspiration syndrome. Therefore, in meconium-stained amniotic fluid, childbirth is usually classified as a high-risk one, which leads to an expansion of indications for operative delivery [13].

A study indicated that premature rupture of membranes plays a certain role in birth in a state of asphyxia, perinatal morbidity, and mortality [12]. Predelivery amniorrhea is of particular importance in the case of incomplete pregnancy because the risks of preterm delivery, perinatal, and infant morbidity and mortality increased [1, 3, 10]. Premature rupture of membranes is a common obstetric pathology, occurring in 10%–19% of cases in term delivery and 5%–35% in preterm delivery [2, 7].

*This study aimed* to determine the effect of meconium-stained amniotic fluid and the duration from rupture to delivery on the birth of a child in a state of asphyxia.

## MATERIALS AND METHODS

A retrospective study was conducted in two groups of 12,342 women who gave birth at the Perinatal Center of the Pediatric University (a third-level obstetric facility). The main group included 272 (2.2%) patients with moderate and severe asphyxia (1-min Apgar score of ≤6 points) [11], where 82 children (3.3%) were born with severe asphyxia and 190 (69.7%) were born with moderate asphyxia. The control "norm" group included 12,070 (97.8%) women who gave birth to children without asphyxia (with a 1-min Apgar score of ≥7 points). The criterion for diagnosing moderate and severe asphyxia was a 1-min Apgar score of ≤6 points and for the absence of asphyxia at birth was a 1-min Apgar score of ≥7 points. The diagnosis of moderate asphyxia was established with a 1-min Apgar score of 4–6 points and severe asphyxia with 1–3 points [11]. The exclusion criterion from the study was multifetal pregnancy, regardless of its outcome.

The study was performed in compliance with the ethical standards of the Declaration of Helsinki of the World Medical Association "Ethical Principles for Medical Research Involving Human Subjects" and "Good Clinical Practice in the Russian Federation" and ethical standards of the local Ethics Committee of the Military Medical Academy.

Statistical data analysis was performed using Statistica 7 (Statsoft Inc., USA). The Mann–Whitney test for independent groups was used to determine the statistical significance of differences between quantitative parameters. Statistical processing of qualitative attributes was performed using Fisher's criteria, $\chi^2$, $\chi^2$ with Yates correction, and odds ratio calculation. A $p$-value <0.05 is generally accepted in medical statistics as a criterion of statistical significance. In this study, the quality of the binary classifications was assessed using the receiver operating characteristic (ROC) curve. To quantify the ROC curve, the area under the ROC curve was used: the higher this indicator, the higher the quality of the classification (0.7–0.8, good; 0.8–0.9, very good; 0.9–1.0, excellent). With a value of 0.5, the classification method corresponded to a random distribution.

## STUDY RESULTS

The rates of meconium-stained amniotic fluid in the presence of moderate and severe hypoxia in full-term and premature fetuses were compared. The results are presented in Tables 1 and 2.

Thus, meconium-stained amniotic fluid was two and five times more common in the presence of fetal hypoxia and severe hypoxia, respectively, during full-term pregnancy, showing statistically significant differences. In incomplete pregnancy, the child can be born in a state of asphyxia regardless of the presence or absence of meconium in the amniotic fluid. However, no studies have further analyzed the causes of meconium-stained amniotic fluid in premature infants. In full-term infants, the release of meconium into the amniotic fluid was dependent on the presence of an infectious lesion of the placenta of various origins (Table 3).

In full-term pregnancy, meconium-stained amniotic fluid was statistically significantly more often associated with ascending infection of all degrees, herpetic and ureaplasmic choriodeciduitis, and a combination of ascending bacterial infection with hematogenous infection of the placenta by various agents.

For further analysis, women who delivered at full-term ($n$ = 11,662) were distributed into the main group ($n$ = 70; neonates with moderate and severe asphyxia) and the control group ($n$ = 11,592; neonates without symptoms of asphyxia).

*Table 1 / Таблица 1*

Meconium staining of amniotic fluid in preterm pregnancy (*n* = 680)
Мекониальная окраска околоплодных вод при недоношенной беременности (*n* = 680)

| Indicator / Показатель | Meconium color of amniotic fluid / Мекониальная окраска околоплодных вод (*n* = 30) | Amniotic fluid is light / Околоплодные воды светлые (*n* = 650) | Statistical significance / Статистическая значимость |
|---|---|---|---|
| Fetal hypoxia, total / Гипоксия плода, всего | 10 (33.3%) | 190 (29.2%) | $p > 0.05$ |
| Severe hypoxia / Тяжелая гипоксия | 5 (16.6%) | 62 (9.5%) | $p > 0.05$ |

*Table 2 / Таблица 2*

Meconium staining of amniotic fluid during full-term pregnancy (*n* = 11,662)
Мекониальная окраска околоплодных вод при доношенной беременности (*n* = 11 662)

| Indicator / Показатель | Meconium color of amniotic fluid / Мекониальная окраска околоплодных вод (*n* = 833) | Amniotic fluid is light / Околоплодные воды светлые (*n* = 10,829) | Statistical significance / Статистическая значимость |
|---|---|---|---|
| Fetal hypoxia, total / Гипоксия плода, всего | 11 (1.3%) | 59 (0.6%) | $p < 0.01$ |
| Severe hypoxia / Тяжелая гипоксия | 4 (0.5%) | 10 (0.1%) | $p < 0.01$ |

*Table 3 / Таблица 3*

Meconium staining of amniotic fluid and the structure of the placenta during full-term pregnancy (*n* = 11,662)
Мекониальная окраска околоплодных вод и строение последа при доношенной беременности (*n* = 11 662)

| Parameter / Показатель | Meconium color of amniotic fluid / Мекониальная окраска околоплодных вод (*n* = 833) | Amniotic fluid is light / Околоплодные воды светлые (*n* = 10,829) | Statistical significance / Статистическая значимость |
|---|---|---|---|
| Ascending infection of placenta, total / Восходящее инфицирование последа, всего | 437 (52.5%) | 3986 (36.9%) | $p < 0.0001$ |
| • I stage / I стадия,<br>• II stage / II стадия,<br>• III stage / III стадия | 218 (26.2%)<br>98 (11.8%)<br>121 (14.5%) | 2611 (24.1%)<br>842 (7.8%)<br>534 (4.9%) | $\chi^2 = 173.22$<br>$p < 0.0001$ |
| Chlamydial choriodeciduitis / Хламидийный хориодецидуит | 49 (5.9%) | 603 (5.6%) | $p > 0.05$ |
| Mycoplasma choriodeciduitis / Микоплазменный хориодецидуит | 221 (26.5%) | 3136 (29.0%) | $p > 0.05$ |
| Ureaplasmic choriodeciduitis / Уреаплазменный хориодецидуит | 65 (7.8%) | 1187 (11.0%) | $p < 0.01$ |
| RNA viral infection / РНК-вирусное инфицирование | 190 (22.8%) | 2703 (25.0%) | $p > 0.05$ |
| DNA viral infection / ДНК-вирусное инфицирование | 1 (0.1%) | 33 (0.3%) | $p > 0.05$ |
| Herpetic infection / Герпетическое инфицирование | 408 (49.0%) | 4871 (45.0%) | $p < 0.05$ |
| Chronic placental insufficiency / Хроническая плацентарная недостаточность:<br>• compensated / компенсированная | 105 (12.6%) | 1645 (15.2%) | $p > 0.05$ |
| • sub- and decompensated / суб- и декомпенсированная | 55 (6.6%) | 705 (6.6%) | $p > 0.05$ |

*Table 3 (continued) / Продолжение таблицы 3*

| Parameter / Показатель | Meconium color of amniotic fluid / Мекониальная окраска околоплодных вод ($n$ = 833) | Amniotic fluid is light / Околоплодные воды светлые ($n$ = 10,829) | Statistical significance / Статистическая значимость |
|---|---|---|---|
| Combined infection of the placenta / Сочетанное инфицирование последа: | | | |
| • no / нет | 331 (39.7%) | 5024 (46.4%) | $\chi^2 = 16.23$ $p < 0.01$ |
| • two agents / два агента | 375 (45.1%) | 4453 (41.2%) | |
| • three agents / три агента | 120 (14.4%) | 1283 (11.9%) | |
| • four agents or more / четыре агента и более | 7 (0.8%) | 54 (0.5%) | |
| Ascending + herpetic infection / Восходящее + герпетическое инфицирование | 237 (28.5%) | 2200 (20.3%) | $p < 0.001$ |
| Ascending + RNA viral infection / Восходящее + РНК-вирусное инфицирование | 96 (11.5%) | 918 (8.5%) | $p < 0.01$ |
| Ascending + mycoplasma infection / Восходящее + микоплазменное инфицирование | 89 (10.7%) | 918 (8.5%) | $p < 0.05$ |
| Ascending + ureaplasma infection / Восходящее + уреаплазменное инфицирование | 36 (4.3%) | 297 (2.8%) | $p < 0.05$ |
| Ascending + chlamydial infection / Восходящее + хламидийное инфицирование | 17 (2.0%) | 180 (1.7%) | $p > 0.05$ |

*Table 4 / Таблица 4*

Premature rupture of amniotic fluid and the duration of the anhydrous period in full-term pregnancy ($n$ = 11,662)
Преждевременное излитие околоплодных вод и длительность безводного промежутка при доношенной беременности ($n$ = 11 662)

| Parameter / Показатель | Main group / Основная группа ($n$ = 70) | Control group / Контрольная группа ($n$ = 11,592) | Statistical significance / Статистическая значимость |
|---|---|---|---|
| Premature rupture of amniotic fluid / Преждевременное излитие околоплодных вод | 45 (64.3%) | 6601 (56.9%) | $p < 0.05$ |
| Dry period, min / Длительность безводного промежутка, мин | 237.9 ± 303.1 | 284.8 ± 198.0 | $p > 0.05$ |

*Table 5 / Таблица 5*

The area under the ROC-curve of the duration of the anhydrous period in children born from a full-term pregnancy in a state of moderate and severe asphyxia and without asphyxia
Площадь под ROC-кривой длительности безводного промежутка у детей, родившихся от доношенной беременности в состоянии асфиксии средней и тяжелой степени и без асфиксии

| Square / Площадь | Standard error / Стандартная ошибка | Asymptotic value / Асимптотическое значение | Asymptotic 95% confidence interval / Асимптотический 95 % доверительный интервал | |
|---|---|---|---|---|
| | | | lower limit / нижняя граница | upper limit / верхняя граница |
| 0.567 | 0.046 | 0.155 | 0.476 | 0.658 |

Premature rupture of membranes statistically significantly more often occurred in full-term infants with asphyxia, although the duration from rupture to delivery was not statistically significantly different between the groups (Table 4). To determine the possibility of using the duration from rupture to delivery in predicting the birth of a full-term infant with asphyxia, an ROC analysis was conducted (Fig. 1, Table 5). The ROC analysis clearly showed the impossibility of this indicator in predicting the birth of a full-term infant with moderate and severe asphyxia, as the predictive model created using this indicator had unsatisfactory quality (area under the curve, 0.5–0.6).

*Table 6 / Таблица 6*

Premature rupture of amniotic fluid and the duration of the anhydrous period in preterm pregnancy ($n = 680$)
Преждевременное излитие околоплодных вод и длительность безводного промежутка при недоношенной беременности ($n = 680$)

| Parameter / Показатель | Main group / Основная группа ($n = 202$) | Control group / Контрольная группа ($n = 478$) | Statistical significance / Статистическая значимость |
|---|---|---|---|
| Premature rupture of amniotic fluid / Преждевременное излитие околоплодных вод | 172 (85.0%) | 413.5 (86.5%) | $p > 0.05$ |
| Dry period, min / Длительность безводного промежутка, мин | 2216.4 ± 8148.1 | 927.4 ± 5685.4 | $p < 0.05$ |

*Table 7 / Таблица 7*

The area under the ROC-curve of the duration of the anhydrous interval in children born prematurely, born in a state of moderate and severe asphyxia and without asphyxia
Площадь под ROC-кривой длительности безводного промежутка у детей, родившихся преждевременно в состоянии асфиксии средней и тяжелой степени и без асфиксии

| Square / Площадь | Standard error / Стандартная ошибка | Asymptotic value / Асимптотическое значение | Asymptotic 95% confidence interval / Асимптотический 95 % доверительный интервал | |
|---|---|---|---|---|
| | | | lower limit / нижняя граница | upper limit / верхняя граница |
| 0.602 | 0.040 | 0.005 | 0.524 | 0.680 |

Similarly, women who had preterm delivery ($n = 680$) were distributed into the main group ($n = 202$, neonates with moderate and severe asphyxia) and the control group ($n = 478$, neonates without asphyxia) (Table 6).

The incidence of premature rupture of membranes in the case of incomplete pregnancy was not statistically significantly different between the main group and the control group. However, the duration from rupture to delivery was statistically significantly longer in women who gave birth to premature babies with asphyxia (Table 6).

To determine the possibility of using the duration from rupture to delivery to predict the birth of a premature infant with asphyxia, an ROC analysis was performed (Fig. 2, Table 7). The analysis demonstrated the low informative value of the duration from rupture to delivery for predicting the birth of a premature infant with moderate and severe asphyxia because the constructed predictive model had average quality (area under the curve 0.6–0.7).

Accordingly, the work aimed to determine the optimal cutoff value to attribute a certain numerical value of the duration from rupture to delivery to one of two classes, namely, high, or low risk of birth of a premature infant with asphyxia. The table of coordinates of the ROC curve enables us to choose a combination of sensitivity of 0.416 (41.6%) and 1-specificity of 0.146 (specificity 0.854 or 85.4%), which determine the cutoff point of 1570 min (Table 8).

The analysis of the ROC curve revealed the optimal cutoff point of 1570 min (26 h 10 min). That is, the optimal duration from rupture to delivery in preterm pregnancy was 26 h. After this time, the risk of delivery with a child with moderate and severe asphyxia increased. Given the average predictive quality of the model due to high specificity, but low sensitivity, this indicator can be also used.

Prolonged duration from rupture to delivery was considered a risk factor for ascending infection of the placenta. The duration from rupture to delivery associated with ascending infection of the placenta in puerperas after premature and term birth is presented in Tables 9 and 10. In the first subgroups, the main group included puerperas with ascending placental infection, whereas the control group included puerperas without ascending bacterial infection. In the second subgroups, the main group included patients with stage 3 ascending placental infection (fetal), whereas the control group included patients without ascending infection and ascending infection of stages 1 and 2.

An ROC analysis was performed to determine the possibility of using the duration from rupture to delivery in predicting the birth of a full-term infant with stage 3 placental infection (Fig. 3, Table 11).

*Table 8 / Таблица 8*

Часть таблицы координат ROC-кривой для определения «точки отсечения»
Part of the table of coordinates of the ROC-curve for determining the "cut-off point"

| Positive, if greater than or equal to / Положительное, если больше или равно | Sensitivity / Чувствительность | 1 – Specificity / 1 – Специфичность |
|---|---|---|
| 9.0000 | 1.000 | 1.000 |
| 1437.5000 | .416 | .158 |
| 1520.0000 | .416 | .154 |
| 1570.0000 | .416 | .146 |
| 1582.5000 | .393 | .146 |
| 1631.0000 | .382 | .146 |
| 95003.0000 | .000 | .004 |
| 109487.0000 | .000 | .000 |

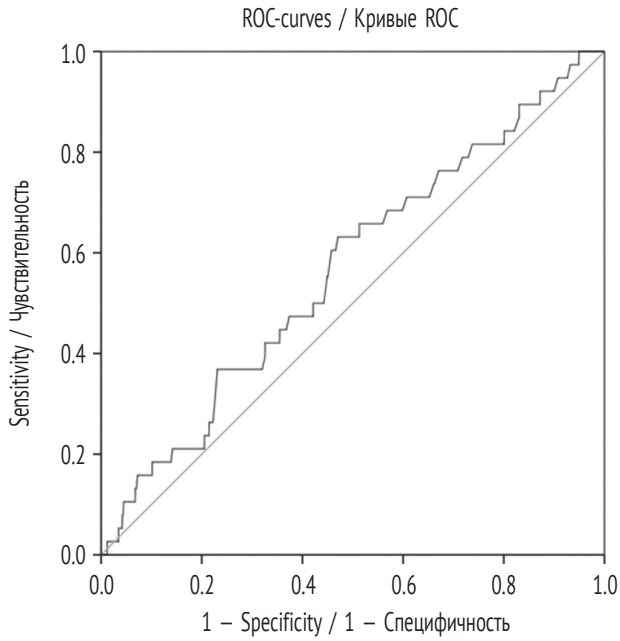


**Fig. 1. ROC-curve of the duration of the anhydrous period in full-term children born in a state of moderate and severe asphyxia and without asphyxia. Diagonal segments are formed by coincidences**

**Рис. 1. ROC-кривая длительности безводного промежутка у доношенных детей, родившихся в состоянии асфиксии средней и тяжелой степени и без асфиксии. Диагональные сегменты формируются совпадениями**

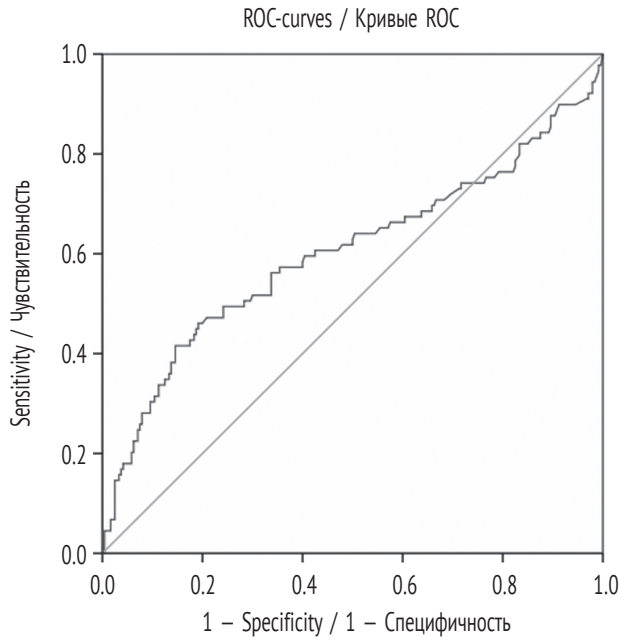


**Fig. 2. ROC-curve of the duration of the anhydrous period in children born prematurely in a state of moderate and severe asphyxia and without asphyxia. Diagonal segments are formed by coincidences**

**Рис. 2. ROC-кривая длительности безводного промежутка у детей, родившихся преждевременно в состоянии асфиксии средней и тяжелой степени, и без асфиксии. Диагональные сегменты формируются совпадениями**

The ROC analysis demonstrated the low informative value of this indicator for predicting stage 3 ascending placental infection in term delivery because the constructed predictive model had a low quality of the model (area under the curve 0.5–0.6). Therefore, this indicator is not suitable when developing an approach for conducting preventive and therapeutic measures.

An ROC analysis was also performed to determine the possibility of the duration from rupture to delivery in predicting stage 3 placental infections in preterm labor (Fig. 4, Table 12). The results demonstrated the moderate informative value of this indicator in predicting stage 3 placental infections because the constructed predictive model had an average quality (area under the curve 0.6–0.7).

*Table 9 / Таблица 9*

The duration of the anhydrous period in puerperas with ascending infection of the placenta after urgent delivery
Длительность безводного промежутка у родильниц с восходящим инфицированием последа после срочных родов

| Parameter / Показатель | Main group / Основная группа | Control group / Контрольная группа | Statistical significance / Статистическая значимость |
|---|---|---|---|
| Number of patients, *n* / Численность групп, *n* | 4427 | 7235 | – |
| Ascending infection of the placenta / Восходящее инфицирование последа | 358.76 ± 345.36 | 238.93 ± 249.62 | $p > 0.05$ |
| Number of patients, *n* / Численность групп, *n* | 655 | 11007 | – |
| Ascending infection after the third stage / Восходящее инфицирование последа третьей стадии | 438.16 ± 446.53 | 238.96 ± 249.97 | $p < 0.05$ |

*Table 10 / Таблица 10*

The duration of the anhydrous period in puerperas with ascending infection of the placenta after premature birth
Длительность безводного промежутка у родильниц с восходящим инфицированием последа после преждевременных родов

| Parameter / Показатель | Main group / Основная группа | Control group / Контрольная группа | Statistical significance / Статистическая значимость |
|---|---|---|---|
| Number of patients, *n* / Численность групп, *n* | 321 | 359 | – |
| Ascending infection of the placenta / Восходящее инфицирование последа | 1926.80 ± 7860.71 | 780.89 ± 5076.71 | $p < 0.05$ |
| Number of patients, *n* / Численность групп, *n* | 52 | 628 | – |
| Ascending infection after the third stage / Восходящее инфицирование последа третьей стадии | 1532.53 ± 4673.43 | 778.69 ± 5069.74 | $p > 0.05$ |

*Table 11 / Таблица 11*

The area under the ROC-curve of the duration of the dry period in puerperas after urgent delivery with afterbirth ascending infection of the third stage
Площадь под ROC-кривой длительности безводного промежутка у родильниц после срочных родов с восходящим инфицированием последа третьей степени

| Square / Площадь | Standard error / Стандартная ошибка | Asymptotic value / Асимптотическое значение | Asymptotic 95% confidence interval / Асимптотический 95 % доверительный интервал | |
|---|---|---|---|---|
| | | | lower limit / нижняя граница | upper limit / верхняя граница |
| 0.536 | 0.011 | 0.000 | 0.613 | 0.658 |

*Table 12 / Таблица 12*

The area under the ROC-curve of the duration of the dry period in puerperas with the presence and absence of afterbirth ascending infection of the third stage after preterm birth
Площадь под ROC-кривой длительности безводного промежутка у родильниц с наличием и отсутствием восходящего инфицирования последа третьей стадии после преждевременных родов

| Square / Площадь | Standard error / Стандартная ошибка | Asymptotic value / Асимптотическое значение | Asymptotic 95% confidence interval / Асимптотический 95 % доверительный интервал | |
|---|---|---|---|---|
| | | | lower limit / нижняя граница | upper limit / верхняя граница |
| 0.671 | 0.043 | 0.000 | 0.587 | 0.755 |

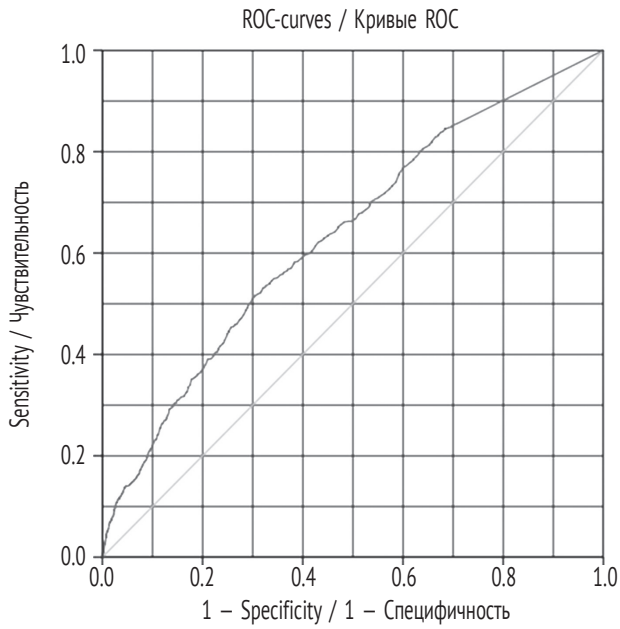


**Fig. 3. ROC-curve of the duration of the dry period in puerperas after urgent delivery with afterbirth ascending infection of the third degree. Diagonal segments are formed by coincidences**

**Рис. 3. ROC-кривая длительности безводного промежутка у родильниц после срочных родов с восходящим инфицированием последа третьей степени. Диагональные сегменты формируются совпадениями**

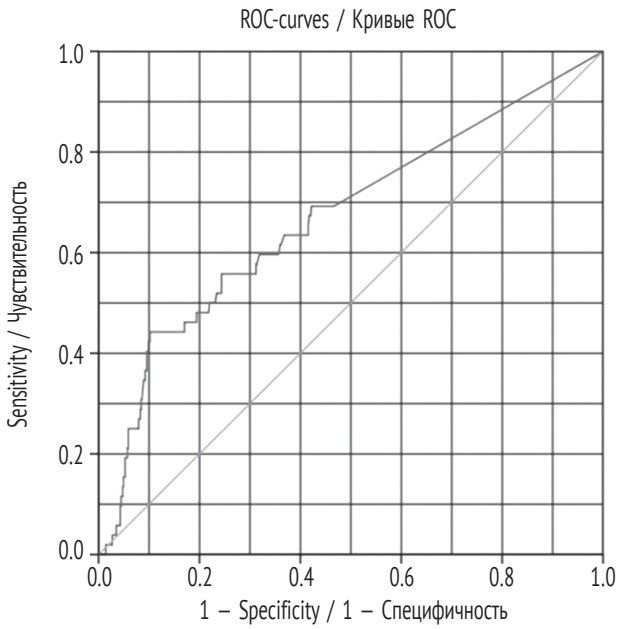


**Fig. 4. ROC-curve of the duration of the dry period in puerperas with the presence and absence of afterbirth ascending infection of the third stage after preterm labor. Diagonal segments are formed by coincidences**

**Рис. 4. ROC-кривая длительности безводного промежутка у родильниц с наличием и отсутствием восходящего инфицирования последа третьей стадии после преждевременных родов . Диагональные сегменты формируются совпадениями**

*Table 13 / Таблица 13*

Part of the table of coordinates of the ROC-curve for determining the "cut-off point" of the indicator of the duration of the dry interval in puerperas with the absence and presence of afterbirth ascending third- stage infection after preterm birth
Часть таблицы координат ROC-кривой для определения «точки отсечения» показателя длительности безводного промежутка у родильниц с отсутствием и наличием восходящего инфицирования последа третьей стадии после преждевременных родов

| Positive, if greater than or equal to / Положительное, если больше или равно | Sensitivity / Чувствительность | 1 – Specificity / 1 – Специфичность |
|---|---|---|
| –1.0000 | 1.000 | 1.000 |
| 5.0000 | .692 | .467 |
| 36.0000 | .692 | .425 |
| 44.5000 | .692 | .424 |
| 53.0000 | .692 | .422 |
| 54.5000 | .673 | .420 |
| 57.5000 | .673 | .417 |
| 95003.0000 | .000 | .002 |
| 109487.0000 | .000 | .000 |

Accordingly, the study also aimed to determine the optimal cutoff value to attribute a certain numerical value of the duration from rupture to delivery to one of the two classes, namely, high, or low risk of birth of a premature infant in a state of asphyxia. The table of coordinates of the ROC curve enables us to choose a combination of the sensitivity of 0.692 (69.2%) and 1-specificity of 0.42 (specificity 0.58 or 57.8%), which determines the cutoff point of 53 min (Table 13).

Thus, when analyzing the risk of stage 3 ascending placental infection (fetal) in incomplete pregnancy, the classification developed using the ROC curve demonstrated a high risk when the duration from rupture to delivery was >53 min, which, given the average quality of the model, makes the prescription of antibacterial drugs appropriate at the time of diagnosis of premature rupture of membranes. The study findings confirm the need for antibiotic therapy in all patients with premature rupture of membranes in the case of incomplete pregnancy, which confirms the expediency of the accepted clinical guidelines [5], despite the objections and recommendations of several researchers [4, 6, 8, 9].

## CONCLUSION

Based on the analysis performed, the following conclusions can be drawn:

1. In an incomplete pregnancy, a neonate can be born with asphyxia regardless of the presence or absence of meconium in the amniotic fluid, which is probably associated with higher rates of birth of infants with asphyxia. That is, the meconium color of the amniotic fluid during incomplete pregnancy is not a prognostically significant indicator for the birth of a neonate with asphyxia.

2. With a rupture to delivery duration of ≥26 h, the risk of having a full-term infant in a state of moderate and severe asphyxia increased. Given the average predictive quality of the model because of the high specificity, but low sensitivity, this indicator can be used as supplementary.

3. The risk of stage 3 ascending placental infection during preterm labor increased with a rupture to delivery interval of > 53 min, which confirms the advisability of prescribing antibiotics for premature rupture of membranes during incomplete pregnancy at the time of diagnostics, regardless of the planned obstetric approach.

## ADDITIONAL INFORMATION

**Author contribution.** Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study.

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◆ Information about the authors

*Vitaly F. Bezhenar* — MD, PhD, Dr. Sci. (Med.), Professor, Head, Department of Obstetrics, Gynecology and Reproductology. Academician I.P. Pavlov First St. Petersburg State Medical University, Ministry of Health of the Russian Federation, Saint Petersburg, Russia. E-mail: lida.ivanova@gmail.com

**Lidiia A. Ivanova* — MD, PhD, Assistant Professor, Department of Obstetrics and Gynecology. Kirov Military Medical Academy, Saint Petersburg, Russia. E-mail: lida.ivanova@gmail.com

*Dmitry O. Ivanov* — MD, PhD, Dr. Sci. (Med.), Professor, Chief Freelance Neonatologist of the Ministry of Health of Russia, Rector, Head of the Department of Neonatology with courses of Neurology and Obstetrics and Gynecology. St. Petersburg State Pediatric Medical University, Ministry of Health of the Russian Federation. E-mail: doivanov@yandex.ru

◆ Информация об авторах

*Виталий Федорович Беженарь* — д-р мед. наук, профессор, заведующий кафедрой акушерства, гинекологии и репродуктологии. ФГБОУ ВО «Первый Санкт-Петербургский государственный медицинский университет им. акад. И.П. Павлова» Минздрава России, Санкт-Петербург, Россия. E-mail: lida.ivanova@gmail.com

**Лидия Алексеевна Иванова* — канд. мед. наук, доцент кафедры акушерства и гинекологии. ФГБВОУ ВО «Военно-медицинская академия им. С.М. Кирова» Министерства обороны России, Санкт-Петербург, Россия. E-mail: lida.ivanova@gmail.com

*Дмитрий Олегович Иванов* — д-р мед. наук, профессор, главный внештатный специалист-неонатолог Минздрава России, ректор, заведующий кафедрой неонатологии с курсами неврологии и акушерства-гинекологии ФП и ДПО. ФГБОУ ВО «Санкт-Петербургский государственный педиатрический медицинский университет» Минздрава России. E-mail: doivanov@yandex.ru

* Corresponding author / Автор, ответственный за переписку

◆ Information about the authors

*Olga L. Krasnogorskaya* — MD, PhD, Assistant Professor, Department of Pathological Anatomy at the rate of Forensic Medicine, Head of Autopsy Department SPbGPMU Clinic. St. Petersburg State Pediatric Medical University, Ministry of Health of the Russian Federation, Saint Petersburg, Russia. E-mail: krasnogorskaya@yandex.ru

◆ Информация об авторах

*Ольга Леонидовна Красногорская* — канд. мед. наук, доцент кафедры патологической анатомии с курсом судебной медицины, заведующая патолого-анатомическим отделением. ФГБОУ ВО «Санкт-Петербургский государственный педиатрический медицинский университет» Минздрава России, Санкт-Петербург, Россия. E-mail: krasnogorskaya@yandex.ru