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Clinical Observation on the Management of Gestational Heart Failure and Delivery Outcomes

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Abstract: *Objective:* This study focuses on the clinical observation of the impact of different treatment methods for gestational heart failure on delivery outcomes. *Method:* A total of 160 pregnant women with heart failure admitted to our hospital between October 2020 and October 2021 were selected as the study subjects. They were categorized based on delivery mode, delivery timing, heart failure control time, and cardiac function status. The delivery outcomes of the different groups were then compared. *Result:* In terms of delivery methods, the rate of neonatal asphyxia was higher following vaginal delivery than cesarean section. Regarding delivery timing, the neonatal mortality rate was lower for cesarean sections performed at 32–36 + 6 weeks compared to those conducted at 37–39 + 6 weeks. With respect to heart failure control time, the rates of neonatal asphyxia and pulmonary hyaline membrane disease were lower in the ≤ 48-hour group than in the > 48-hour group. From the perspective of cardiac function status, patients with cardiac function I–II exhibited relatively lower rates of neonatal asphyxia and perinatal mortality compared to those with cardiac function III–IV. The observed differences were statistically significant ($P < 0.05$). *Conclusion:* For patients with gestational heart failure, cesarean section is the recommended mode of delivery, with the optimal timing being between 32 and 36+6 weeks of pregnancy. During cesarean section, the timing of delivery should be carefully selected based on the mother's cardiac function status.

Keywords: Pregnancy; Heart failure management; Delivery method; Clinical observation

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1. Introduction

Heart failure during pregnancy is a severe complication with potentially life-threatening consequences for both the mother and the infant. Although its incidence is relatively low, the condition poses significant risks. Gestational heart failure can result from various underlying factors, including gestational hypertension, congenital heart

disease, and valvular heart disease. As pregnancy progresses, the cardiovascular burden on the maternal heart increases substantially, particularly during the later stages, where additional blood volume and pressure may exacerbate pre-existing heart conditions or precipitate heart failure.

Effectively managing gestational heart failure requires selecting appropriate delivery methods and timing to ensure the safety of both mother and infant. In recent years, advancements in medical technology and an enhanced understanding of gestational heart failure have led to updated clinical research and improved treatment strategies. These developments aim to provide more scientifically grounded and effective diagnostic and therapeutic approaches for patients with gestational heart failure.

This study examines 160 patients with gestational heart failure admitted to our hospital, focusing on the impact of delivery methods, timing, and heart failure management on maternal and neonatal outcomes.

2. Materials and methods

2.1. General information

This study included 160 pregnant women with heart failure admitted to the hospital between October 2020 and October 2021. The patients were aged between 22 and 38 years, with a mean age of 27.3 ± 2.5 years. Among them, 120 patients underwent cesarean section delivery, while 40 opted for vaginal delivery. All patients had singleton pregnancies. Of the 120 cesarean deliveries, 98 were performed at gestational weeks 32–36 + 6, and 22 at gestational weeks 37–39 + 6. Regarding heart failure control time, 110 patients achieved control within ≤ 48 hours, while 50 patients required > 48 hours. Based on cardiac function classification, 108 patients were categorized as grades I–II, and 52 as grades III–IV [1].

Inclusion criteria: Patients were included if they met the diagnostic criteria for gestational heart disease and heart failure, had no prior history of kidney, heart, liver, or hypertensive disease, and provided informed consent along with their families.

Exclusion criteria: Patients with other diseases or comorbidities, or those unable to cooperate fully with the study, were excluded.

2.2. Research methods

Upon diagnosis of gestational heart failure, a comprehensive treatment plan was implemented. While medication was administered to control heart failure symptoms, particular attention was paid to protecting pulmonary function. Dexamethasone was frequently used, as it promotes fetal lung maturation and mitigates potential pulmonary edema, ensuring adequate preparation for subsequent cesarean section surgery.

Based on individual patient conditions, a cesarean section was scheduled within 24 to 48 hours. During this period, medical staff closely monitored heart failure control. If a patient's condition was stable, gestational age relatively early, and heart failure symptoms well-managed, gestational age was extended to allow further fetal development. Conversely, if fetal health was poor, regardless of maternal heart failure control, cesarean section was performed within 24 hours to prioritize maternal and neonatal safety [2]. Employing a comprehensive treatment strategy ensured maternal safety while optimizing fetal health outcomes.

2.3. Evaluation indicators

(1) Assessment of asphyxia: Neonatal Apgar scores were utilized as a benchmark for evaluation. Newborns

scoring 4–7 within 1 minute of birth were classified as experiencing neonatal asphyxia.

(2) Low birth weight determination: Newborns with a birth weight of less than 2,500 grams were categorized as low birth weight infants. These infants face heightened health risks, including developmental delays and weakened immunity.

(3) Adverse prognosis: This included outcomes such as neonatal pulmonary hyaline membrane disease and mortality. Pulmonary hyaline membrane disease, often resulting from immature lung development or injury, poses a significant risk to neonatal life and health [3].

2.4. Statistical methods

Statistical analyses were conducted using SPSS 13.0 software. Data were entered into the system, and t-tests were employed to determine whether differences between groups were statistically significant. For categorical data, the chi-square test was applied to assess the correlation between variables. This test evaluates whether differences between observed and expected values are due to random error or indicative of an actual correlation or difference. A result was considered statistically significant if $P < 0.05$.

3. Result

3.1. Pregnancy outcomes under different delivery methods

A comparison of pregnancy outcomes between delivery methods revealed that the neonatal asphyxia rate was significantly higher in the vaginal delivery group than in the cesarean section group, and this difference was statistically significant ($P < 0.05$). These findings suggest that, when other factors are controlled, cesarean section reduces the risk of neonatal asphyxia to a certain extent. However, regarding the rates of low birth weight, pulmonary hyaline membrane disease, and perinatal mortality, no statistically significant differences were observed ($P > 0.05$) between the two groups. This indicates that the delivery method alone may not be a decisive factor in these outcomes, or its effects may be influenced by other significant factors. Detailed data are presented in **Table 1**.

Table 1. Pregnancy outcomes of different delivery methods [*n* (%)]

Group	Neonatal asphyxia	Low-birth-weight infants	Pulmonary hyaline membrane disease	Perinatal death
Cesarean section ($n = 120$)	14 (11.7)	57 (47.5)	8 (6.7)	3 (2.5)
Vaginal delivery ($n = 40$)	12 (30.0)	23 (57.5)	7 (17.5)	2 (5.0)

3.2. Surgical timing

The timing of cesarean section surgery significantly affects neonatal health. Specifically, cesarean sections performed at 32–36 + 6 weeks of gestation were associated with a significantly higher incidence of low-birth-weight infants compared to surgeries performed at 37–39 + 6 weeks, and this difference was statistically significant ($P < 0.05$). This indicates that earlier cesarean sections increase the risk of low-birth-weight infants. However, no statistically significant differences ($P > 0.05$) were observed in the rates of neonatal asphyxia, pulmonary hyaline membrane disease, or perinatal mortality between the two timing groups. Detailed data are presented in **Table 2**.

Table 2. Pregnancy outcomes at different cesarean section timings [*n* (%)]

Timing	Neonatal asphyxia	Low-birth-weight infants	Pulmonary hyaline membrane disease	Perinatal death
32–36 + 67 weeks (*n* = 98)	9 (9.2)	52 (53.1)	7 (7.1)	2 (2.0)
37–39 + 6 weeks (*n* = 40)	3 (7.5)	4 (10.0)	1 (2.5)	0 (0.0)

3.3. Heart failure control time

The duration of heart failure control significantly impacts neonatal outcomes. Patients whose heart failure was controlled within 48 hours had a significantly lower incidence of neonatal asphyxia and pulmonary hyaline membrane disease compared to those with control times exceeding 48 hours, and these differences were statistically significant ($P < 0.05$). However, no significant differences ($P > 0.05$) were observed in the rates of low birth weight or perinatal mortality between the two groups. Detailed data are presented in **Table 3**.

Table 3. Pregnancy outcomes at different heart failure control times [*n* (%)]

Timing	Neonatal asphyxia	Low-birth-weight infants	Pulmonary hyaline membrane disease	Perinatal death
≤ 48 hours (*n* = 110)	4 (3.6)	38 (34.5)	3 (2.7)	2 (1.8)
> 48 hours (*n* = 50)	13 (26.0)	20 (40.0)	7 (14.0)	1 (2.0)

3.4. Classification of cardiac function

Cardiac function classification significantly affects neonatal asphyxia and perinatal mortality rates. Neonatal asphyxia and mortality rates were significantly lower among patients with cardiac function grades I–II compared to those with grades III–IV ($P < 0.05$). However, no statistically significant differences ($P > 0.05$) were observed in the rates of pulmonary hyaline membrane disease or low-birth-weight infants between the two groups. Detailed data are presented in **Table 4**.

Table 4. Pregnancy outcomes based on cardiac function classification [*n* (%)]

Classification	Neonatal asphyxia	Low-birth-weight infants	Pulmonary hyaline membrane disease	Perinatal death
I–II (*n* = 108)	0 (0.0)	49 (45.4)	7 (6.5)	1 (0.9)
III–IV (*n* = 52)	13 (25.0)	11 (21.2)	1 (1.9)	2 (3.8)

4. Discussion

Pregnancy-induced heart failure represents a severe complication in obstetrics, posing significant threats to the lives of pregnant women and profoundly influencing neonatal prognosis. This study investigates the relationships between termination methods, surgical timing, heart failure control duration, cardiac function status, and neonatal outcomes in patients with gestational heart failure, with the aim of providing a foundation for informed clinical decision-making.

Regarding the choice of pregnancy termination methods, the findings of this study indicate that cesarean section has significant advantages over vaginal delivery in reducing the incidence of neonatal asphyxia. This can be attributed to the shorter duration of the delivery process during cesarean section, which alleviates the cardiac

burden on the mother and promptly alleviates intrauterine hypoxia in the fetus. Consequently, cesarean section is a safer and more effective option for patients with gestational heart failure [4].

In terms of surgical timing, this study demonstrates that cesarean sections performed within 32–36+6 weeks of gestation are associated with a lower incidence of low-birth-weight infants compared to other gestational periods, contributing to improved neonatal prognosis. Therefore, while actively managing heart failure symptoms, it is essential for medical personnel to plan surgical timing carefully to ensure the safety of both mother and child.

The duration of heart failure control also significantly influences neonatal outcomes. The results show that prolonged heart failure control time increases the risk of neonatal asphyxia and pulmonary hyaline membrane disease. This underscores the necessity of initiating effective treatment promptly to control heart failure symptoms in the shortest time possible, thereby creating optimal conditions for subsequent cesarean delivery.

Additionally, the study highlights the importance of maternal cardiac function status, showing that pregnant women with better cardiac function experience a lower incidence of neonatal asphyxia. This finding emphasizes the critical role of a comprehensive preoperative cardiac function assessment and the development of individualized treatment plans based on the patient's cardiac status.

5. Conclusion

In conclusion, the clinical management of pregnant patients with heart failure is a complex and meticulous process requiring the careful consideration of multiple factors. Selecting an appropriate termination method, optimizing surgical timing, effectively controlling heart failure symptoms, and thoroughly evaluating cardiac function status are essential steps to ensure maternal and neonatal safety, reduce the risk of neonatal complications, and enhance overall treatment outcomes. In future clinical practice, medical personnel should continue to advance research on gestational heart failure, refine treatment protocols, and contribute to improving maternal and child health outcomes.

Disclosure statement

The authors declare no conflict of interest.

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