

Clinical Value of Insulin Aspartate Injection in The Treatment of Obstetric Gestational Diabetes Mellitus

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Abstract: Gestational diabetes mellitus (GDM) is a common metabolic disorder during pregnancy, which has a high incidence and has a serious impact on maternal and infant health, including premature delivery, macrosomia and postpartum complications. Therefore, timely and effective treatment is particularly important. The purpose of this study was to investigate the clinical value of insulin aspartate in the management of gestational diabetes mellitus, and to provide evidence for improving the treatment of gestational diabetes mellitus. Through the comprehensive analysis of the pharmacological properties and clinical applications of insulin aspartate, the research results showed that insulin aspartate can effectively control blood sugar levels and reduce adverse pregnancy outcomes in the treatment of gestational diabetes mellitus. It is worth noting that during the use of insulin aspartate, the impact on the mother and child is relatively small, and does not affect breastfeeding, reflecting its importance in the treatment of gestational diabetes. To provide a new treatment idea for the clinical management of gestational diabetes mellitus, emphasize the importance of individualized treatment, and lay a foundation for future related research.

Keywords: Gestational diabetes mellitus; Insulin aspartate; Clinical application; Security analysis

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1. Introduction

Gestational diabetes mellitus (GDM) refers to abnormalities in sugar metabolism that first appear during pregnancy, usually between 24 and 28 weeks of gestation. According to epidemiological studies, the incidence of GDM is on the rise worldwide, especially in high-risk populations, and the incidence can be as high as 15%^[1]. This disease not only affects the health of pregnant women but is closely related to the development of the fetus and its health after birth. Gestational diabetes can lead to macrosomia, premature delivery, birth canal damage and neonatal hypoglycemia and other adverse pregnancy outcomes, which brings potential health risks to mothers and infants^[2].

The main goal of treating gestational diabetes is to control maternal blood sugar levels to reduce adverse

effects on the mother and child. This not only helps to improve the pregnancy experience of the mother but also significantly reduces the risk of complications during childbirth ^[3]. In addition, scientific and sound management measures can reduce the risk of developing type 2 diabetes later on. Individualized treatment for gestational diabetes, combined with dietary regulation, exercise, and insulin therapy, can help achieve a good pregnancy outcome.

2. Basic overview of insulin aspartate

2.1. Pharmacological properties of insulin aspartate

Insulin aspartate is a fast-acting recombinant human insulin used to control blood sugar levels, especially in the management of postprandial hyperglycemia. Its pharmacological mechanism is to promote the uptake and utilization of glucose by cells through binding to insulin receptors on cell membranes, thereby reducing glucose concentration in the blood. The onset time of insulin aspartate is usually 10 to 20 minutes after injection, the peak effect occurs 1 to 3 hours after injection, and the duration of action is about 3 to 5 hours ^[4]. This property makes it particularly suitable for use with meals to effectively control blood sugar fluctuations after meals. In addition, the molecular structure of insulin aspartate has been modified to have better solubility and absorbability, thus improving its bioavailability ^[5]. Compared with other types of insulin, insulin aspartate has greater flexibility in administration, and patients can adjust according to meal time and blood sugar level, which significantly improves the individualization and adaptability of treatment. This makes insulin aspartate an important option in the management of gestational diabetes, which can effectively help pregnant women control blood sugar and reduce the risk of pregnancy complications ^[6].

2.2. Comparison with other insulin preparations

Compared with other insulin preparations, insulin aspartate has significant advantages and different adaptations. Compared with traditional intermediate-acting and long-acting insulin (such as NPH insulin and insulin glargine), insulin aspartate is more suitable for mealtime injection because of its rapid onset and short action time, and can quickly control the rise of postprandial blood sugar. This feature makes insulin aspartate particularly suitable for patients with gestational diabetes who need to adjust their blood sugar levels frequently. In addition, when compared to fast-acting insulins such as lispro and almotriptan, insulin aspartate has become a more widely used choice due to its greater stability and clinical studies supporting its safety during pregnancy ^[7-9]. Although other fast-acting insulin formulations can also rapidly control blood sugar, the use of insulin aspartate in pregnant patients has extensive clinical data supporting its safety and effectiveness for both mother and child. In addition, insulin aspartate is highly compatible and can be used in combination with other types of insulin to achieve more refined blood sugar management.

2.3. Application history and clinical research progress of insulin aspartate

The history of the use of insulin aspartate dates back to 2004 when it was first approved. As a fast-acting insulin formulation, insulin aspartate was developed to meet the needs of patients with diabetes for flexible and efficient blood sugar control. Studies have shown that insulin aspartate has significant advantages in the control of postprandial blood sugar, so it has been widely used in clinical practice. In the years that followed, insulin aspartate was gradually incorporated into diabetes treatment guidelines and recommended for patients with different types of diabetes, especially those who require refined blood sugar control, such as pregnant women and severely ill patients ^[10]. In clinical studies of gestational diabetes mellitus, insulin aspartate has shown good safety and efficacy. A large number of clinical trials have shown that insulin aspartate can effectively control blood sugar levels in patients with gestational diabetes and reduce adverse pregnancy outcomes for pregnant women and fetuses. For example, some studies have shown that pregnant women using

insulin aspartate have significantly lower rates of macrosomia than those using other insulin formulations. In addition, insulin aspartate has also shown good results in reducing the incidence of hypoglycemia, giving patients more security ^[11].

In recent years, with the deepening of research, more and more clinical data support the efficacy and safety of insulin aspartate in the treatment of gestational diabetes mellitus. More and more doctors and patients are recognizing the potential of insulin aspartate in personalized therapy, with the ability to flexibly adjust the dose according to the specific situation of the patient. This makes insulin aspartate one of the indispensable treatment options in the management of gestational diabetes ^[12].

3. Application of insulin aspartate in gestational diabetes mellitus

3.1. Administration mode and dose adjustment of insulin aspartate

The administration of insulin aspartate in gestational diabetes mellitus is usually a subcutaneous injection, which is not only simple and easy but also suitable for the daily use of most patients. According to the patient's specific blood glucose monitoring results, the dosage of insulin aspartate needs to be adjusted individually. In general, the initial dose is set at the beginning of treatment based on the patient's basal blood glucose level and postprandial blood glucose status, and then gradually adjusted based on the blood glucose monitoring results. Injections of insulin aspartate are usually recommended within 15 minutes before meals for it to work quickly to control blood sugar after meals. For those patients with poor blood sugar control after meals, increasing the dose or adjusting the time of administration may be necessary ^[13]. In addition, due to the physiological changes in women during pregnancy, especially as the pregnancy progresses, insulin sensitivity and demand will change, so patients need to regularly monitor blood sugar to timely adjust the insulin dose and injection strategy.

3.2. Use strategies for different pregnancy periods

At different stages of pregnancy, patients with gestational diabetes have different insulin requirements and blood sugar management strategies. In the first trimester, the patient's blood sugar levels are relatively low and the dosage of insulin aspartate is usually smaller. As pregnancy progresses, changes in placental hormone levels lead to increased insulin resistance and the patient needs to gradually increase the dose of insulin aspartate ^[14]. During the second and third trimesters, patients' insulin needs tend to rise significantly due to the increased demands of fetal growth and metabolism. Therefore, during this period, blood sugar should be closely monitored and the dose should be adjusted in time to prevent complications caused by high blood sugar. For patients in the third trimester of pregnancy, especially near the stage of delivery, doctors usually strictly evaluate the frequency and dosage of insulin aspartate to ensure the safety of maternal and child health ^[15].

3.3. Monitoring and evaluation criteria in clinical practice

The clinical use of insulin aspartate requires strict monitoring and evaluation criteria to ensure that the blood glucose control of gestational diabetes mellitus is within the ideal range. Blood glucose monitoring is an important part of the management of gestational diabetes mellitus, patients should regularly self-measure fasting blood glucose and postprandial blood glucose, and record the results. It is generally recommended that pregnant women have their blood sugar tested before and within 1 hour after a meal to assess the effect of insulin therapy. In clinical practice, the doctor will evaluate the patient's blood sugar control based on the monitoring results, and adjust the dosage of insulin aspartate as needed ^[16]. In addition, regular prenatal visits are also very important, including fetal growth monitoring and maternal health assessment, to ensure the safe course of pregnancy. By comprehensively monitoring blood sugar, evaluating the effects of medication, and keeping a close eye on maternal and child health, healthcare teams can individualize treatment options for people with gestational diabetes, thereby reducing the risk of adverse pregnancy outcomes.

4. Safety analysis of insulin aspartate

4.1. Maternal and fetal adverse reactions

Insulin aspartate is widely used in the treatment of gestational diabetes mellitus, however, its use still needs to be concerned about possible adverse reactions. For mothers, the use of insulin aspartate may lead to a risk of hypoglycemia, especially if the dose is not properly adjusted or the intake of meals is insufficient. Symptoms of hypoglycemia include sweating, shaking, palpitations and dizziness, and can even lead to loss of consciousness in severe cases. Patients need to be educated to recognize early signs of hypoglycemia and to prepare emergency sugar sources for prompt treatment ^[17]. In addition, the use of insulin aspartate may also lead to weight gain, because insulin itself has a growth-promoting effect, so it is necessary to monitor weight and develop a reasonable diet and exercise plan to reduce the risk of weight gain.

The use of insulin aspartate is relatively safe for the fetus, and clinical studies have not found a significant association with fetal malformation or other major adverse events. However, caution should still be exercised during use to ensure that blood sugar levels are controlled to prevent fetal growth, macrosomia, and other related complications due to high blood sugar. Therefore, doctors should consider the health status of the mother and the development of the fetus to achieve the best treatment ^[18].

4.2. Precautions in the use of insulin aspartate

In the clinical application of insulin aspartate, medical staff and patients need to pay attention to several aspects to ensure the safety and effectiveness of treatment. Patients should fully understand the mechanism of action and the method of administration of insulin aspartate before using it, especially in terms of dose adjustment and injection techniques ^[19]. Educate patients to master the method of self-blood glucose monitoring, record and feedback on blood glucose changes to doctors regularly, to adjust the treatment plan. Due to physiological changes during pregnancy, patients' insulin requirements may change with the progression of pregnancy, so it is necessary to regularly evaluate the effect of blood glucose control and timely adjust the dosage of insulin aspartate to prevent the occurrence of hyperglycemia and hypoglycemia.

There may be interactions between insulin aspartate and other medications, so patients should inform their doctor of all medications and supplements used during medication. At the same time, pregnant women should pay attention to the adjustment of diet and exercise during the use of insulin, and reasonably arrange meals and exercise to maintain good blood sugar control ^[20]. Finally, postpartum need to continue to pay attention to the use of insulin aspartate, especially during breastfeeding, to ensure the safety of the drug for mother and child.

4.3. Effects on breastfeeding

Regarding the effect of insulin aspartate on breastfeeding, the current study results show that the use of insulin aspartate is relatively safe during lactation. The concentration of insulin in breast milk is extremely low and usually does not have a noticeable effect on the baby, so breastfeeding mothers do not need to stop breastfeeding while using insulin aspartate. Breastfeeding is not only good for the health of the baby, but it also helps the mother regain weight and blood sugar levels after delivery. Through breastfeeding, the mother is able to pass on antibodies, improve the baby's immunity, and also contribute to the mother's mental health and the establishment of parent-child relationships.

However, mothers still need to monitor their blood sugar levels closely while using insulin aspartate, especially at the beginning of breastfeeding, as breastfeeding may cause changes in the mother's blood sugar levels. Therefore, the medical team should guide the mother on how to carry out appropriate blood sugar monitoring and diet adjustment during breastfeeding to ensure the health of the mother and child. In addition,

medical personnel should pay attention to the emotional and psychological state of the mother, support her smooth transition to breastfeeding, and ensure the safety and health of the mother during the use of insulin aspartate.

5. Conclusion

In this paper, the clinical value of insulin aspartate in the treatment of gestational diabetes mellitus was discussed, and the importance of insulin aspartate in improving maternal and infant health was emphasized. Gestational diabetes mellitus (GDM) is a common complication of pregnancy. Without timely intervention, it may have serious effects on the mother and fetus. With the deepening of the understanding of gestational diabetes mellitus, timely and effective treatment has become an inevitable demand, and insulin has gradually become an important choice for the treatment of this disease due to its rapid onset and good safety. By analyzing the pharmacological properties of insulin aspartate and its comparison with other insulin preparations, we found that it has significant advantages in post-prandial blood glucose control and is suitable for different use strategies during pregnancy.

In clinical application, the administration mode and dose adjustment of insulin aspartic need to be individualized to meet the needs of different patients. At the same time, regular blood glucose monitoring and evaluation criteria are the key to ensuring the effectiveness of treatment. In terms of safety, although the use of insulin aspartate may cause adverse reactions such as hypoglycemia, compared with other treatment methods, its risk is relatively low, and it is suitable for pregnant patients. In addition, the effects on breastfeeding suggest that the use of insulin aspartate during lactation is safe and provides health assurance for both mother and baby.

In summary, the good effect of insulin aspartate in the treatment of gestational diabetes provides strong support for improving maternal and infant health and is of great significance for promoting the management and treatment of gestational diabetes. With the deepening of clinical research, the application potential of insulin aspartate will be further explored, and more safe and effective treatment options will be brought to the majority of pregnant women.

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Song M, Tian C, Zhu Q, 2019, Effects of Metformin Combined with Insulin Aspartate on Blood Glucose Level and Maternal and Infant Outcomes in Patients with Gestational Diabetes Mellitus. *New World of Diabetes Mellitus*, 26(10): 104–107.
- [2] Wang C, Zhu Y, Liu F, 2013, Effects of Vitamin D Combined with Insulin Aspartate on Glycolipid Metabolism and Insulin Resistance in Gestational Diabetes Mellitus. *Journal of Medical Informatics*, 36(7): 131–134.
- [3] Wei R, Zhou L, Wang J, 2002, Effects of Insulin Detemide Combined with Insulin Aspartate, Diet, and Exercise on Blood Glucose Index and Maternal and Infant Outcomes of Gestational Diabetes Mellitus. *New World of Diabetes Mellitus*, 25(23): 85–87 + 91.
- [4] Xu S, Zhen M, Long X, et al., 2019, Effect of Insulin Aspartate Combined with High-Dose Vitamin D Regimen on Neonatal Hypocalcemia of Gestational Diabetes Mellitus. *Chinese Journal of Drug Abuse Prevention and Control*, 28(11): 1607–1610.
- [5] Guo X, Xiao S, Wen X, 2019, Effects of Insulin Aspartate on Blood Glucose and Glycated Hemoglobin in Patients with Gestational Diabetes Mellitus. *Journal of Clinical Rational Use of Medicine*, 15(25): 82–84.
- [6] Niu X, Fang Y, Qiang D, et al., 2019, Effect of Insulin Aspartate Combined with Vitamin D in the Treatment of Gestational Diabetes Mellitus. *Ningxia Medical Journal*, 44(8): 728–730.
- [7] Amei M, Yan'e C, Yongmei L, et al., 2022, Exercise-Diet Therapy Combined with Insulin Aspartate Injection for

the Treatment of Gestational Diabetes Mellitus: A Study on Clinical Effect and Its Impact. *Computational and Mathematical Methods in Medicine*, 2022: 488061–4882061.

- [8] Meng X, 2022, Clinical Effect Analysis of Insulin Aspartate Combined with Nutrition and Exercise Intervention in Patients with Gestational Diabetes Mellitus. *Journal of Hebei Medicine*, 44(11): 1650–1653.
- [9] Bi L, Yong M, Feng J, 2022, Clinical Value of Vitamin D Adjuvant Insulin Aspartate in the Treatment of Gestational Diabetes Mellitus. *Ningxia Medical Journal*, 44(5): 447–449.
- [10] Yang L, Yu H, Huang C, 2022, Effect of Insulin Aspartate in Patients with Gestational Diabetes Mellitus and Analysis of Pregnancy Outcomes. *China Maternal and Child Health Care*, 37(10): 1785–1787.
- [11] Wang L, 2022, Observing the Effect of Subcutaneous Injection of Insulin Aspartate in the Treatment of Gestational Diabetes Mellitus with Sleep Disorders and Its Effect on Pregnancy Outcome and Sleep Quality in Pregnant Women. *World Journal of Sleep Medicine*, 9(4): 664–667.
- [12] Liu Y, Liu X, Chen L, 2019, Effects of Dietary Intervention Combined with Insulin Aspartate on Blood Glucose Control and Maternal and Infant Outcomes of Gestational Diabetes Mellitus. *Journal of Clinical Research*, 30(1): 84–87.
- [13] Zhang X, Wang Y, Su Q, 2021, Effects of Glimepiride Combined with Insulin Aspartate on Insulin Resistance and Islet Cell Secretion in Patients with Gestational Diabetes Mellitus. *Hainan Medical Science*, 32(23): 3054–3057.
- [14] Zhang Y, Zhong L, Zeng H, 2021, Effect of Insulin Detemide Combined with Insulin Aspartate on Maternal and Infant Outcomes of Gestational Diabetes Mellitus. *New World of Diabetes Mellitus*, 24(15): 81–84.
- [15] Zhang M, 2019, Clinical Effect of Subcutaneous Insulin Aspartate Injection Combined with Protamine Biosynthetic Human Insulin in the Treatment of Gestational Diabetes Mellitus. *Journal of Shanxi Health Vocational College*, 31(2): 73–75.
- [16] Xu X, Wang Q, Hu X, 2019, Effect of Precision Nutrition Management Combined with Insulin Aspartate on Blood Glucose and Hemodynamics in Patients with Gestational Diabetes Mellitus. *Shanghai Journal of Medicine*, 41(23): 46–48 + 84.
- [17] Wang Z, Wu S, 2019, Clinical Observation of Insulin Aspartate and Insulin Detemide in the Treatment of Gestational Diabetes Mellitus. *Shanghai Journal of Medicine*, 41(20): 30–33.
- [18] Xu Y, Zhou S, Xiao B, 2020, Application of Insulin Aspartate Combined with Metformin in Patients with Gestational Diabetes Mellitus. *Clinical Journal of Practical Hospital*, 17(3): 155–158.
- [19] Fan S, Dong W, Liu W, et al., 2020, Effect of Calcium Carbonate D3 Combined with Insulin Aspartate on Patients with Gestational Diabetes Mellitus. *Journal of Contemporary Medicine*, 18(7): 159–160.
- [20] Lu L, Chen Q, Luo X, et al., 2019, Effect of Premixed Insulin Aspartate Injected by Insulin Pump and Subcutaneous Injection of Recombinant Human Insulin in the Treatment of Gestational Diabetes Mellitus and Its Influence on Pregnancy Outcome. *Journal of Clinical Medicine*, 39(9): 107–108.

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