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When Cancer Meets Crisis: Chronic Myeloid Leukemia, Severe Preeclampsia and a Surprise Ectopic Pregnancy in a Rare Multidisciplinary Case

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ABSTRACT

Chronic myeloid leukemia (CML) is a myeloproliferative neoplasm characterized by the BCR-ABL1 fusion gene resulting from the t(9;22)(q34;q11) translocation. The advent of tyrosine kinase inhibitors (TKIs), particularly imatinib, has significantly improved the prognosis of CML. However, the management of CML during pregnancy poses challenges due to the teratogenic potential of TKIs and the risk of disease progression upon their discontinuation. We report the case of a 23-year-old primigravida with a 9-year history of CML managed with imatinib 400 mg/day. Upon confirmation of pregnancy, imatinib was discontinued. At 38+2 weeks of gestation, she presented with severe preeclampsia and underwent induction of labor with dinoprostone, which failed. A cesarean section under general anesthesia was performed, resulting in the delivery of a low-birth-weight infant (2.3 kg) without complications. Postoperatively, the patient resumed imatinib therapy. This case underscores the complexities in managing CML during pregnancy, balancing the teratogenic risks of TKIs against the potential for disease progression. The decision to use general anesthesia was influenced by concerns over central nervous system (CNS) contamination by circulating blasts during neuraxial anesthesia, despite the patient not being in a blast crisis. Multidisciplinary management like involvement of oncologist, gynecologist and anesthesiologist is crucial in pregnant patients with CML. General anesthesia may be preferred over neuraxial techniques in certain scenarios to mitigate potential CNS complications. Further research is needed to establish standardized guidelines for the anesthetic management of such patients.

INTRODUCTION

Chronic myeloid leukemia (CML) is a clonal hematopoietic stem cell disorder characterized by the presence of the Philadelphia chromosome, formed by a reciprocal translocation between chromosomes 9 and 22, which generates the BCR-ABL1 fusion gene encoding a constitutively active tyrosine kinase that drives leukemogenesis [1].

The introduction of tyrosine kinase inhibitors (TKIs), such as imatinib, has revolutionized CML treatment, transforming it from a fatal disease to a manageable chronic condition with near-normal life expectancy [2].

However, the management of CML during pregnancy remains challenging. TKIs are classified as FDA Pregnancy Category D due to evidence of fetal risk, particularly during the first trimester [3]. Discontinuation of TKIs during pregnancy can lead to disease progression, including the risk of blast crisis, which is associated with poor outcomes [4]. Moreover, the choice of anesthetic technique during delivery in such patients is complex, especially when considering the potential for CNS contamination by leukemic blasts during neuraxial anesthesia [5] .

This case report highlights the anesthetic management considerations in a pregnant woman with CML and severe preeclampsia, emphasizing the decision-making process regarding the choice of anesthesia during cesarean delivery.

Case Presentation

A 23-year-old primigravida with a 9-year history of Chronic Myeloid Leukemia (CML), maintained on imatinib 400 mg daily, was referred for obstetric care at 38+2 weeks of gestation due to severe preeclampsia. The patient had discontinued imatinib upon confirmation of pregnancy and was closely monitored throughout gestation by a multidisciplinary team including oncologist, hematologist, gynecologist. On admission, she exhibited severe-range hypertension (160/110 mmHg), significant proteinuria (protein-creatinine ratio 56.8 mg/mmol), and

generalized edema. Neurological examination was unremarkable, with no signs of impending eclampsia. Laboratory investigations revealed leukocytosis (WBC 14,500/μL) consistent with her underlying CML. Hemoglobin was 9.2 g/dL, indicating anemia of chronic disease, while platelet count remained adequate (304,000/μL).

Induction of labor was initiated with dinoprostone due to an unfavorable cervix. However, after 24 hours, cervical dilation remained at 1 cm with minimal effacement, and the fetal vertex was high at -3 station. Given the failure of induction, worsening preeclampsia, and the need to promptly resume CML therapy postpartum, a decision was made to proceed with cesarean delivery. Due to theoretical concerns about neuraxial anesthesia in CML patients—particularly the risk of introducing leukemic cells into the CNS—general anesthesia was selected. The procedure was uneventful, delivering a low-birth-weight infant (2.3 kg) with good Apgar scores. Postoperatively, the patient received multimodal analgesia and thromboprophylaxis with low-dose aspirin. Her blood pressure was controlled with oral antihypertensives, and she was discharged in stable condition with plans to restart imatinib under oncologist supervision.

Four months later, the patient returned with left lower abdominal pain and a positive pregnancy test. Transvaginal ultrasound revealed no intrauterine gestation but identified a 1.1 cm right adnexal mass containing a small gestational sac (0.47 cm), consistent with an unruptured ectopic pregnancy. The patient's initial serum β-hCG level was 1469 IU/L, for which she received a 100 mg intramuscular dose of methotrexate. Within 72 hours, her β-hCG level rose to 3084 IU/L, prompting administration of a second dose of methotrexate at the same dosage. Subsequently, her β-hCG levels steadily declined, reaching 5.3 IU/L by the 20th day following the first injection. The ectopic pregnancy was resolved without any adverse events. She was also informed about the higher likelihood of recurrence and the need for early ultrasound evaluation in future pregnancies.

This case highlights the complexities of managing CML in pregnancy, including the balance between maternal hematologic control and fetal safety, the challenges of severe preeclampsia, and the importance of vigilance for unexpected complications like ectopic pregnancy. Multidisciplinary coordination between obstetricians, hematologists, and anesthesiologists was critical to optimizing outcomes for both mother and baby.

DISCUSSION

Chronic myeloid leukemia (CML) is a rare occurrence in women of reproductive age, accounting for approximately 10–15% of all leukemias in adults [6]. The management of CML during pregnancy poses unique challenges for clinicians, given the potential teratogenicity of first-line therapies and the risk of disease progression in the mother [6]. This case report illustrates the delicate balance between optimizing maternal outcomes and minimizing fetal risks in a pregnant woman with CML and superimposed severe preeclampsia, culminating in a cesarean delivery under general anesthesia.

Most pregnant patients with CML are diagnosed before conception and are receiving tyrosine kinase inhibitors (TKIs), such as imatinib, dasatinib, or nilotinib. Imatinib, the first-generation TKI, has significantly improved the prognosis of CML, but its use during pregnancy is associated with a range of fetal anomalies including skeletal malformations and congenital abnormalities, especially if used during organogenesis (first trimester) [7]. For this reason, guidelines recommend discontinuing TKIs during pregnancy and considering alternative therapies such as leukapheresis or interferon-alpha, particularly in the first and second trimesters [3].

In our case, imatinib was appropriately discontinued upon confirmation of pregnancy, and the patient remained clinically stable in the chronic phase. This decision aligns with literature suggesting that treatment interruption may be safe in patients with a deep molecular response, although this is not without risk [8] . The fact that the patient did not progress to accelerated or blast phase during pregnancy represents a favorable outcome, and possibly reflects close monitoring and pre-pregnancy disease control.

The addition of severe preeclampsia further complicated the clinical scenario. Preeclampsia remains one of the leading causes of maternal and perinatal morbidity and mortality worldwide, characterized by endothelial dysfunction, vasoconstriction, and multiorgan involvement [9].In this patient, it necessitated delivery at 38+2 weeks, with induction of labor using dinoprostone. Given the failed induction and rising maternal risks, a cesarean section was indicated.

The choice of anesthetic technique in this scenario required multidisciplinary deliberation. While neuraxial anesthesia is generally preferred in preeclamptic patients due to better hemodynamic stability and decreased sympathetic response , its use in patients with hematologic malignancies, such as CML, remains controversial [10]. The medical team choose general anesthesia to completely avoid the theoretical possibility of introducing malignant cells into the central nervous system via direct needle trauma, as this risk, though rare, is supported by case reports and expert opinion, particularly in immunocompromised or hematologically unstable patients, even though the patient was not in blast crisis and her peripheral smear did not show circulating blasts [10,11].

This case underscores several key clinical principles. First, the importance of pre-conception counseling and careful planning for women with chronic conditions like CML cannot be overstated. Ideally, pregnancy should be planned during periods of stable disease with deep molecular response [8]. Second, the management of CML during pregnancy should involve a multidisciplinary team, including hematologists, obstetricians, anesthesiologists, and neonatologists. Decisions such as timing of delivery, mode of delivery, and anesthesia technique must be made collaboratively and tailored to the individual patient.

This case highlights the importance of assessing hematologic conditions in pregnant patients before cesarean delivery. Although neuraxial anesthesia isn't universally contraindicated in CML, it warrants caution in unstable or poorly controlled cases. Here, general anesthesia was deemed safer to prevent CNS complications, despite its inherent risks like aspiration, difficult intubation, and hemodynamic fluctuations [12].

The strength of this case lies in its rarity and the detailed documentation of clinical reasoning behind anesthetic decision-making in a high-risk obstetric patient. It also contributes to the limited literature on CML and anesthesia considerations in pregnancy. However, this case report is limited by its single-patient design, limiting generalizability. Long-term maternal and neonatal outcomes were not assessed and the choice of general anesthesia was based on theoretical concerns due to limited evidence.

There is a pressing need for prospective data and registries on the management of pregnant women with hematologic malignancies, especially regarding anesthesia-related risks and outcomes. Furthermore, guidelines on anesthetic choice in leukemic patients, particularly regarding neuraxial techniques, need refinement based on empirical data rather than theoretical concerns alone.

CONCLUSION

This case highlights the challenges of managing pregnant CML patients with severe preeclampsia. General anesthesia was chosen for cesarean delivery due to theoretical CNS contamination risks from neuraxial anesthesia, despite no blast crisis. Multidisciplinary teamwork is crucial to weigh maternal-fetal risks, and more research is needed for evidence-based guidelines in managing hematologic malignancies during pregnancy.

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