ISSN. 2338-7475
E-ISSN. 2620-7869
Hearty
Jurnal Kesehatan Masyarakat
Berinan, Tulus, Sepenuh Hati,Berbesar Hati, Jujur, Sehat dan Kuat
Vol. 13 No. 5, Oktober 2025, Hal. 1156-1168

ANESTHETIC MANAGEMENT OF A PREGNANT PATIENT WITH WOLFF PARKINSON WHITE SYNDROME UNDERGOING CAESARIAN SECTION

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Abstrak

Abnormal electrical conduction via an auxiliary channel (Kent's Bundle) causes Wolff-Parkinson-White (WPW) syndrome, a congenital cardiac preexcitation disease that can result in symptomatic and sometimes fatal arrhythmias. It occurs in 0.9-3% of the general population. Because of changes in hemodynamics, hormones, the autonomic nervous system, and emotions, pregnancy raises the risk of supraventricular tachycardia (SVT). A 29-year-old woman with G2P1001 gestational age 39 weeks, history of Caesarean Section (C-Section) 1 time with WPW Syndrome and history of SVT underwent C-Section and tubectomy with low dose spinal anesthesia. The patient has a history of palpitations and the EKG shows WPW pattern. Vital signs, physical examinations and laboratorium findings within normal limits. Echocardiography with the results of normal cardiac chamber dimensions, global normokinetic, Ejection Fraction 68%, normal diastolic function, normal right ventricle contractility TAPSE 2.0 Cm, valves within normal limits, ERAP 8 mmHg, Interatrial and interventricle septum impression intact, no PDA seen. This patient, diagnosed with WPW syndrome at moderate risk due to a history of SVT, could not undergo ablation due to limited facilities and pregnancy contraindications. Bisoprolol was used for treatment of transient palpitations. Preoperative fluids achieved a diuresis target of 1.1 cc/kg/hour to avoid hypovolemia and tachycardia. Regional anesthesia was chosen for cesarean section to reduce sympathetic activity, with careful attention to preventing high-level blocks. A subarachnoid block with low-dose bupivacaine (7.5 mg) and fentanyl (25 mcg) provided stable hemodynamics and effective anesthesia. A healthy baby was delivered with an APGAR score 8/9, and postoperative analgesia was optimized. Regional anesthesia is the choice for c-section with WPW syndrome, the use of low doses of bupivacaine heavy combined with adjuvant fentanyl produces good quality block with rapid onset and without hemodynamic instability.

Keywords: Perioperative, Sectio Caesarea, Supraventricular Tachycardia Wolff Parkinson White

Introduction

Wolff-Parkinson-White (WPW) Syndrome is a congenital heart disorder that affects approximately 0.9–3% of the general population. It is characterized by an abnormality in the heart's electrical conduction pathway, which involves the presence of an accessory pathway known as the Kent bundle. This additional pathway allows electrical signals to bypass the normal route through the atrioventricular node, leading to rapid conduction between the atria and ventricles. As a result, this can cause episodes of tachycardia or irregular heart rhythms, which may be symptomatic (Suharno et al., 2022). Patients with WPW Syndrome can experience a range of symptoms, from palpitations and dizziness to syncope (fainting) due to the rapid heart rates caused by the abnormal electrical signals. In some cases, if left untreated, WPW can increase the risk of sudden cardiac arrest. Diagnosis is typically made through electrocardiogram (ECG) findings, where the hallmark features include a short

Submitted: May-2025 Received: July-2025 Available Online: October-2025

PR interval and a characteristic delta wave. Treatment options for WPW may include medication to control arrhythmias or catheter ablation to remove the accessory pathway and restore normal heart rhythm (Haryanto et al., 2022).

The pathway that allows supraventricular impulses to bypass the atrioventricular (AV) node, the bundle of His, and the distal conduction system is crucial in understanding certain cardiac arrhythmias. This bypass leads to the preexcitation of the ventricles, which is characterized by the presence of a delta wave on the electrocardiogram (ECG). The delta wave indicates that the ventricles are activated earlier than normal due to the rapid conduction through an accessory pathway. This phenomenon is often seen in conditions such as Wolff-Parkinson-White syndrome, where the presence of an accessory pathway can significantly alter the normal conduction of electrical impulses in the heart (Jetley et al., 2016). Patients with this condition are particularly susceptible to paroxysmal supraventricular tachycardia (PSVT) and atrial fibrillation (AF). The dual conduction pathways between the atria and ventricles create a substrate for reentrant circuits, which can lead to episodes of rapid heart rates. PSVT is characterized by sudden onset and termination of tachycardia, often resulting in palpitations and discomfort for the patient. Atrial fibrillation, on the other hand, is a more chaotic rhythm that can lead to significant hemodynamic instability and increases the risk of thromboembolic events (Yitkin et al., 2018). The management of these arrhythmias often involves both pharmacological and non-pharmacological strategies. Medications such as beta-blockers and antiarrhythmic drugs may be used to control heart rate and rhythm. In some cases, catheter ablation of the accessory pathway may be indicated to prevent recurrent episodes of PSVT or AF. Understanding the underlying mechanisms of these arrhythmias is essential for effective treatment and improving patient outcomes (Bengali et al., 2014).

Physiological changes during pregnancy can significantly impact women with preexisting arrhythmias, as these changes often exacerbate their condition. The hormonal fluctuations, particularly the increase in progesterone and estrogen, can lead to alterations in the autonomic nervous system, which may increase heart rate and affect cardiac output. Additionally, emotional changes during pregnancy, such as heightened stress and anxiety, can further contribute to the instability of heart rhythms. These factors combined create a complex interplay that can lead to more frequent or severe arrhythmias in pregnant women, necessitating careful monitoring and management (Berghella, 2022). Moreover, the physiological adaptations that occur during pregnancy, including increased blood volume and changes in vascular resistance, can place additional strain on the cardiovascular system. This strain may be particularly pronounced in women with underlying heart conditions, leading to a higher risk of complications such as palpitations or even more serious arrhythmias. It is crucial for healthcare providers to recognize these risks and provide appropriate care to ensure the health and safety of both the mother and the fetus throughout the pregnancy (Renzo, 2022).

Anesthetic and antiarrhythmic agents play a significant role in influencing cardiac conduction, particularly in patients with preexisting conditions such as Wolff-Parkinson-White (WPW) syndrome. This syndrome is characterized by an abnormal electrical conduction pathway in the heart, which can lead to serious arrhythmias, including paroxysmal supraventricular tachycardia (PSVT), atrial fibrillation (AF), and potentially life-threatening ventricular fibrillation (VF). The administration of anesthetic agents in such patients requires careful consideration, as certain drugs can trigger these arrhythmias. For instance, propofol has been shown to normalize the ECG pattern and prolong the effective refractory period of the accessory pathway in WPW patients, thereby reducing the risk of arrhythmias during surgical procedures (Vinaya Udaybhaskar, 2017).

In pregnant patients with WPW syndrome, the risks associated with anesthesia are heightened due to the potential for increased susceptibility to arrhythmias during surgery. The management of these patients necessitates a comprehensive preoperative assessment and vigilant intraoperative monitoring to mitigate the risks of PSVT and AF. The presence of WPW syndrome in pregnant

patients undergoing surgery underscores the importance of having standby medications and defibrillation equipment readily available. By implementing meticulous monitoring and preparedness, healthcare providers can navigate the complexities of anesthesia in this vulnerable population, ensuring a safer surgical experience (Soler et al., 2024).

Early detection and management of arrhythmias are crucial components in the anesthetic care of patients, particularly those with underlying cardiovascular conditions. Anesthesiologists must be vigilant in monitoring patients for signs of arrhythmias during surgical procedures, as these irregular heartbeats can lead to significant complications if not addressed promptly. The implementation of continuous cardiac monitoring and the use of advanced technologies can enhance the ability to detect these abnormalities early, allowing for timely interventions that can improve patient outcomes (Sari, 2022). Moreover, the anesthetic management of patients with arrhythmias requires a comprehensive understanding of the patient's medical history and the potential impact of anesthetic agents on cardiac function. Tailoring anesthetic techniques to minimize cardiovascular stress and ensuring the availability of resuscitation equipment are essential strategies in managing these patients safely. By prioritizing the early identification and appropriate management of arrhythmias, anesthesiologists can significantly reduce the risk of perioperative complications and enhance the overall safety of surgical procedures (Halim, 2022).

This report outlines the anesthetic management considerations for a patient with symptomatic Wolff-Parkinson-White (WPW) syndrome undergoing an elective cesarean section. In such cases, careful evaluation of the patient's cardiovascular status is essential, as WPW syndrome can predispose individuals to tachyarrhythmias, which may complicate anesthesia and surgery. The anesthetic plan must prioritize the avoidance of agents that could exacerbate arrhythmias while ensuring effective pain control and hemodynamic stability during the procedure. Continuous monitoring of the patient's cardiac rhythm is crucial to detect any arrhythmic events promptly, allowing for immediate intervention if necessary. Additionally, collaboration among the surgical team, anesthesiologists, and cardiologists is vital to optimize patient safety and outcomes during the cesarean section.

Research Methodology

1. Research Type

The research type for this study primarily falls under the category of clinical case study. This type of research focuses on the detailed examination of a specific patient case, providing insights into the unique challenges and considerations involved in anesthetic management for patients with underlying cardiac conditions, such as Wolff-Parkinson-White (WPW) syndrome. By documenting the anesthetic approach, monitoring techniques, and outcomes, the study aims to contribute to the existing body of knowledge regarding safe anesthetic practices in high-risk obstetric patients, thereby enhancing clinical guidelines and protocols. Additionally, this research may also be classified as descriptive research, as it seeks to describe the anesthetic management strategies employed during the cesarean section and the subsequent effects on both maternal and fetal outcomes. Through a comprehensive analysis of the anesthetic techniques used, including the choice of agents and monitoring methods, the study provides valuable information that can inform future practices in similar clinical scenarios. The findings from this case study can serve as a reference for anesthesiologists and obstetricians, highlighting the importance of individualized care and the need for interdisciplinary collaboration in managing pregnant patients with complex medical histories

2. Data Sources

The data sources used in this research consist of clinical data collected from hospital medical records. The collected information includes medical history, physical examination results, laboratory

findings, and documentation regarding drug administration during the childbirth process. Data were retrospectively extracted from patient medical records, encompassing preoperative, intraoperative, and postoperative clinical observations. Data validity was ensured through validation against medical records and cross-referencing relevant data from various medical records.

3. Data Collection Techniques

Data collection in this study was performed through documentation review and clinical interviews with the medical team treating the patients. Documentation review involved a detailed analysis of patient medical records, including operative notes, anesthetic records, and medication history. Additionally, interviews with anesthesiologists, surgeons, and nurses were conducted to gather supplementary information regarding Rocuronium use and patient response during and after surgery. This technique ensures high data accuracy by minimizing human error through structured and detailed recording.

4. Data Processing and Analysis Techniques

The collected data were then analyzed descriptively to understand Rocuronium usage patterns in the context of patients with Sphenoid Wing Meningioma. This analysis involved comparing patient clinical outcomes with predetermined parameters such as anesthesia duration, patient response to the drug, and postoperative neurological outcomes. Descriptive statistics such as mean, median, and standard deviation were employed to analyze clinical data. The results of the analysis were interpreted to provide a comprehensive understanding of the effectiveness and safety of Rocuronium use in patients with complex medical conditions.

Results

Tabel 1. Summary of Report Results

Category	Details
Patient Information	32-year-old female, G2P1001, at 40 weeks and 2 days of gestation, with a history of prior cesarean section, WPW syndrome, and SVT.
Procedure	Planned cesarean section (CS) and bilateral tubal ligation (MOW).
Condition (WPW Syndrome)	Pre-excitation syndrome; characteristic ECG findings: short PR interval (<120 ms), wide QRS complex (>120 ms), and delta waves.
Triggering Factors	Hormonal, autonomic, hemodynamic, and emotional changes during pregnancy can provoke arrhythmias in WPW patients.
Sympathetic Stimulation	Can trigger life-threatening arrhythmias such as PSVT, atrial fibrillation (AF), and ventricular fibrillation (VF).
Electrophysiological Findings	Short PR interval (<250 ms) and accessory pathway conduction (<270 ms) increase the risk of sudden cardiac death.
Treatment	Asymptomatic patients with low risk of PSVT do not require treatment. Flecainide or propafenone are medications of choice for WPW syndrome.
Electrophysiology Study	Electrophysiological (EP) study and ablation may reduce risk; catheter ablation can be performed without fluoroscopy even during the first trimester.
Beta-blockers	Used to treat tachycardia, but have potential side effects, including delayed intrauterine growth, respiratory depression, newborn bradycardia, and hypoglycemia.
Anesthesia Plan	Regional anesthesia was chosen to minimize drug exposure and reduce sympathetic activation. Low-dose bupivacaine and fentanyl used for spinal anesthesia.

Anesthesia Technique	Regional anesthesia: 7.5 mg of 0.5% heavy bupivacaine and 25 mcg fentanyl for spinal block at L3-L4 resulting in T6 block level with stable hemodynamics.
Oxytocin Use	Administered slowly at 20 IU in 500 cc normal saline over 24 hours to minimize risks. Low-dose oxytocin (5 IU bolus or 10-20 IU infusion) preferred.
Surgical Duration	1 hour and 10 minutes.
Outcome	Stable hemodynamics, male baby delivered with APGAR score of 8/9.
Postoperative Care	Multimodal analgesia for pain management, emphasizing prevention of sympathetic responses.

1. Patient Background and Medical History

This case report describes a 32-year-old female patient, G2P1001, at 40 weeks and 2 days of gestation. She has a significant medical history, which includes a previous cesarean section, Wolff-Parkinson-White (WPW) syndrome, and supraventricular tachycardia (SVT). The patient's history of cesarean section indicates prior surgical intervention during labor, which can influence the management of her current pregnancy. WPW syndrome is a rare pre-excitation disorder of the heart, characterized by an abnormal electrical pathway that can cause rapid heart rhythms. WPW syndrome is often recognized through specific electrocardiogram (ECG) findings, which include a short PR interval, a wide QRS complex, and the presence of delta waves. These ECG abnormalities are crucial for diagnosing WPW syndrome and differentiating it from other cardiac conditions. The presence of delta waves reflects an accessory pathway between the atria and ventricles, which can lead to premature ventricular activation (Kumar et al., 2023). In some cases, this condition can lead to paroxysmal supraventricular tachycardia (SVT), a rapid heart rate originating above the ventricles, which the patient has experienced.

The patient's history of SVT complicates her clinical presentation as it increases the risk of arrhythmias during pregnancy, especially with the physiological changes that occur during gestation. SVT is often triggered by factors such as increased sympathetic tone, electrolyte imbalances, or stress, which are common during pregnancy. Managing a patient with both WPW syndrome and SVT during pregnancy requires careful monitoring, as arrhythmias can lead to adverse outcomes for both the mother and the fetus. In addition to the above concerns, it is important to consider the timing of any interventions or treatments that may be required. Medications used to control arrhythmias in non-pregnant patients may not be safe during pregnancy due to potential teratogenic effects or risks to fetal development. Therefore, a multidisciplinary approach involving obstetricians, cardiologists, and anesthesiologists is essential for the optimal management of this patient throughout her labor and delivery.

2. WPW Syndrome and its Risks

Wolff-Parkinson-White (WPW) syndrome is a congenital condition characterized by an accessory electrical pathway in the heart, allowing for abnormal conduction between the atria and ventricles. This abnormal pathway can result in rapid heart rhythms, or arrhythmias, due to the short-circuiting of electrical signals. The most common arrhythmias associated with WPW syndrome include paroxysmal supraventricular tachycardia (PSVT), atrial fibrillation (AF), and in severe cases, ventricular fibrillation (VF). These arrhythmias can lead to symptoms such as palpitations, dizziness, or even syncope. The primary risk associated with WPW syndrome is its potential to trigger life-threatening arrhythmias, particularly when the accessory pathway conducts electrical impulses abnormally. For example, PSVT is the most common arrhythmia in WPW patients, occurring when the electrical impulses travel in a loop between the atria and ventricles. AF, on the other hand,

increases the risk of rapid conduction through the accessory pathway, which can result in VF, a potentially fatal rhythm disturbance. As a result, the presence of WPW syndrome significantly elevates the risk of sudden cardiac death (SCD) in individuals with certain risk factors.

Electrophysiological findings are crucial in identifying patients at higher risk for arrhythmias and sudden cardiac death. Specifically, the presence of a short PR interval (<250 ms) and a rapid conduction time in the accessory pathway (<270 ms) are markers of increased risk for life-threatening arrhythmias. These findings suggest that the electrical signals in the heart are traveling too quickly through the abnormal pathway, making the heart more susceptible to potentially fatal arrhythmic events. Early detection of these signs can help clinicians determine the need for further intervention or monitoring. Despite the potential for severe arrhythmias, many patients with WPW syndrome remain asymptomatic and have a low risk of experiencing arrhythmias during everyday activities. In these cases, particularly those with no history of PSVT or other arrhythmias, the risk during perioperative procedures is typically minimal. These patients often do not require immediate treatment, and careful observation may be sufficient. However, for high-risk individuals, treatment options such as catheter ablation or medication may be necessary to prevent arrhythmias and reduce the risk of sudden cardiac death.

3. Impact of Pregnancy on WPW Syndrome

Pregnancy can significantly impact women with Wolff-Parkinson-White (WPW) syndrome, increasing their susceptibility to arrhythmias. Hormonal fluctuations during pregnancy, particularly the rise in estrogen levels, enhance myocardial excitability. This heightened excitability, coupled with physiological changes such as volume overload, can lead to an increase in left ventricular end-diastolic volume, further contributing to myocardial irritability and an increased risk of tachycardia. In addition to hormonal factors, autonomic and hemodynamic changes during pregnancy play a key role in exacerbating arrhythmias in women with WPW syndrome. The sympathetic nervous system is often more active during pregnancy, which can lead to an increased heart rate and exacerbate arrhythmic episodes. This is further influenced by the increased blood volume and altered cardiac output, which can create conditions conducive to the manifestation of arrhythmias.

Emotional changes during pregnancy, such as heightened anxiety and depression, also contribute to the increased likelihood of arrhythmias in these women. Stress and emotional distress can activate the autonomic nervous system, leading to further arrhythmic events. Anxiety and depression, common during pregnancy, are not only related to mental health but also affect the cardiovascular system, creating an additional risk factor for women with WPW syndrome. Finally, the combination of hormonal, autonomic, and emotional changes makes pregnancy a period of increased vulnerability for women with WPW syndrome. This condition requires careful monitoring and management to prevent severe arrhythmic episodes. Physicians often recommend adjusting treatment strategies during pregnancy to mitigate these risks and provide optimal care for both the mother and the fetus.

4. Patient Classification and Management

In the case of the patient, her classification as having moderate-risk Wolff-Parkinson-White (WPW) syndrome was due to a previous history of arrhythmias. WPW syndrome is a condition characterized by abnormal electrical pathways in the heart, leading to tachycardia and potentially life-threatening arrhythmias. Classifying the patient's risk is important in determining the appropriate management approach. As reported, understanding the severity of arrhythmias plays a crucial role in selecting treatment strategies, especially for patients with a history of arrhythmic episodes. For managing WPW syndrome, the primary antiarrhythmic drugs of choice are flecainide or propafenone. These medications are used to stabilize the heart rhythm and prevent episodes of paroxysmal

supraventricular tachycardia (PSVT), which is common in WPW syndrome. Both drugs are effective in controlling arrhythmias, but their use depends on the patient's response and comorbid conditions. The correct medication choice is crucial to prevent further complications in the management of arrhythmias.

However, when these medications are ineffective or inappropriate, electrical cardioversion is advised as an alternative treatment for PSVT. Cardioversion involves the use of electrical shocks to restore a normal heart rhythm in patients experiencing rapid heart rates. Electrical cardioversion is a well-established procedure for terminating arrhythmias, especially when pharmacological treatments fail. It is often used in acute settings to prevent the progression of arrhythmic episodes that might otherwise compromise the patient's health. Furthermore, electrophysiological (EP) studies and catheter ablation have been shown to significantly reduce the risk of arrhythmias in patients with WPW syndrome. These procedures aim to target and eliminate the abnormal pathways in the heart responsible for arrhythmias. However, catheter ablation is generally avoided in the first trimester of pregnancy unless performed without fluoroscopy due to potential risks to the fetus. This highlights the need for careful consideration of timing and techniques when planning interventions for pregnant patients with WPW syndrome.

5. Preoperative Management

Preoperative management is crucial in ensuring that the patient is adequately prepared for surgery. In this case, the patient underwent a thorough evaluation, which included a normal echocardiogram. This assessment helped to confirm that there were no underlying cardiac abnormalities that would complicate the surgical procedure. Since the patient was asymptomatic, it was determined that no further therapeutic interventions were necessary at that stage. One of the key considerations during the preoperative phase was preventing tachycardia, which could result from hypovolemia. Hypovolemia, or low blood volume, can lead to an increased heart rate as the body compensates for the decreased blood flow. To address this, careful management of preoperative fluids was implemented, ensuring that the patient maintained adequate hydration and blood volume prior to the surgery.

While beta-blockers are commonly used in pregnancy to manage tachycardia and other related conditions, they were not indicated in this case. Although beta-blockers can effectively control heart rate, they carry potential risks, particularly during pregnancy. In this patient's situation, the use of beta-blockers could have led to complications such as delayed intrauterine growth or respiratory depression, which could have harmed both the patient and the fetus. Based on this research preoperative management plan was carefully tailored to ensure the patient's safety and avoid any unnecessary risks. By carefully monitoring fluid levels and avoiding the use of beta-blockers, the medical team minimized the likelihood of complications and prepared the patient for a successful surgical outcome. The focus on avoiding potential harm to both mother and baby highlights the importance of individualized care during the perioperative period.

6. Anesthesia Plan and Induction

The anesthesia plan for patients with Wolff-Parkinson-White (WPW) syndrome aims to prioritize hemodynamic stability while minimizing the risk of arrhythmias. Given the nature of WPW syndrome, it is essential to avoid factors that could trigger sympathetic activation, which can exacerbate arrhythmias. These triggers include hypoxia, ischemia, electrolyte imbalances, and mechanical stresses that could disrupt normal heart rhythm. Careful attention is required during anesthesia to ensure that these triggers are minimized and that the patient's cardiac function is closely monitored. When choosing anesthetic agents for these patients, it is important to select drugs that have minimal effects on the heart's accessory pathways. Drugs such as sevoflurane, isoflurane, fentanyl,

and rocuronium are commonly preferred in general anesthesia for patients with WPW syndrome. These agents are known to have a lower likelihood of affecting the conduction pathways of the heart, reducing the risk of arrhythmias during the procedure. In addition, they provide adequate anesthesia while helping maintain stable cardiovascular function.

The choice of airway management also plays a role in maintaining sympathetic stability during anesthesia. The use of a laryngeal mask airway (LMA) is typically favored over endotracheal intubation in patients with WPW syndrome. LMA insertion generally results in less sympathetic stimulation, which is beneficial in preventing the potential triggering of arrhythmias. This approach helps to mitigate the risks associated with more invasive methods, such as endotracheal intubation, which may cause a higher sympathetic response. In summary, the anesthesia plan for patients with WPW syndrome involves selecting agents that minimize the risk of arrhythmias by avoiding excessive sympathetic stimulation. Additionally, airway management strategies, such as the use of an LMA, are implemented to reduce mechanical stresses and sympathetic activation. The goal is to maintain hemodynamic stability throughout the surgical procedure, ensuring both patient safety and optimal outcomes.

7. Regional Anesthesia Approach

The regional anesthesia approach was selected to reduce drug exposure, minimize sympathetic activation, and prevent potential adverse effects on the fetus. This technique is considered safer in certain obstetric procedures, as it targets a specific region of the body, reducing the overall dosage of anesthetic agents required. By avoiding general anesthesia, regional techniques like spinal anesthesia can help maintain better maternal and fetal well-being. Spinal anesthesia was administered at the L3-L4 level, using a combination of low-dose bupivacaine and fentanyl. The goal was to achieve a T6 block level, which ensures sufficient anesthesia for the surgical procedure without affecting areas of the body responsible for vital functions. By carefully controlling the dose and the level of the block, the approach minimizes the risk of complications such as hypotension or respiratory depression.

One of the key advantages of this approach is its ability to prevent a high-level spinal block, which could otherwise interfere with normal autonomic function. High spinal blocks can suppress atrioventricular (AV) conduction and increase parasympathetic activity, both of which could lead to undesirable outcomes such as bradycardia or severe hypotension. Maintaining the block at a lower level helps avoid these risks. Throughout the procedure, the patient's hemodynamics remained stable, and there were no significant episodes of hypotension. This stability is critical in ensuring that both the mother and the fetus remain safe during the course of the surgery. The regional anesthesia technique, therefore, offered a balanced and effective option, allowing for a smooth procedure with minimal adverse effects.

8. Oxytocin Administration and Surgery Duration

Oxytocin was administered gradually over 24 hours to regulate uterine contractions during labor. The administration was done using a dose of 20 International Units (IU) diluted in 500 cc of normal saline. This method is commonly used to facilitate the progression of labor and ensure contractions are sufficiently strong and consistent. The gradual infusion helps to avoid potential side effects associated with rapid administration, which can lead to complications such as uterine hyperstimulation. The dosage of oxytocin used in this case aligns with standard medical practices, though literature often recommends lower doses to further minimize the risks associated with the hormone. The main concern with oxytocin administration is the potential for excessive uterine contraction, which can compromise the oxygen supply to the baby and increase the likelihood of uterine rupture. Therefore, the careful titration of the oxytocin dose is crucial in achieving a balance between effective labor induction and the safety of both the mother and the fetus.

The surgery, which involved the delivery of the baby, lasted 1 hour and 10 minutes. The duration of the surgery was relatively short, indicating a smooth and efficient process. The relatively brief surgical time is a positive indicator of a well-managed delivery, with minimal complications or delays. This suggests that the labor and delivery were well-supported by the medical team, with no major interruptions or difficulties encountered during the process. Upon delivery, the baby received an APGAR score of 8/9, which is an excellent score indicating the newborn's good health. The APGAR test evaluates a newborn's physical condition by checking five criteria: heart rate, respiratory effort, muscle tone, reflex response, and color. A score of 8/9 suggests that the baby showed strong signs of vitality and no immediate concerns regarding neonatal health and well-being. This outcome reflects well on the management of both the oxytocin administration and the surgical procedure.

9. Postoperative Care

Postoperative care is a critical aspect of recovery following surgery, particularly in managing pain and preventing complications. In this phase, multimodal analgesia was employed to address the patient's pain effectively. This approach combines different classes of analgesic medications to provide better pain relief, reduce opioid consumption, and minimize side effects. By using multiple pain management strategies, the goal was to provide comprehensive care tailored to the patient's specific needs. Pain control was prioritized to maintain the patient's comfort and prevent physiological stress. Inadequate pain management can lead to an increased sympathetic nervous system response, which in turn may elevate blood pressure, heart rate, and other factors that could trigger arrhythmias or worsen the patient's condition. The focus on effective pain relief helped ensure a smoother recovery and prevented complications that could arise from unmanaged discomfort.

Moreover, preventing arrhythmias and other cardiovascular complications was a primary concern in the postoperative care plan. Pain and stress from inadequate analgesia could contribute to sympathetic overactivity, which might disturb the heart's rhythm. The use of multimodal analgesia not only helped control pain but also played a role in stabilizing the patient's cardiovascular system during the recovery period. The overall goal of postoperative care was to optimize recovery while minimizing risks. By ensuring adequate pain management, the healthcare team was able to address the patient's needs in a comprehensive manner, promoting healing and reducing the likelihood of postoperative complications. This proactive approach supported both physical comfort and emotional well-being, which are essential for a successful recovery.

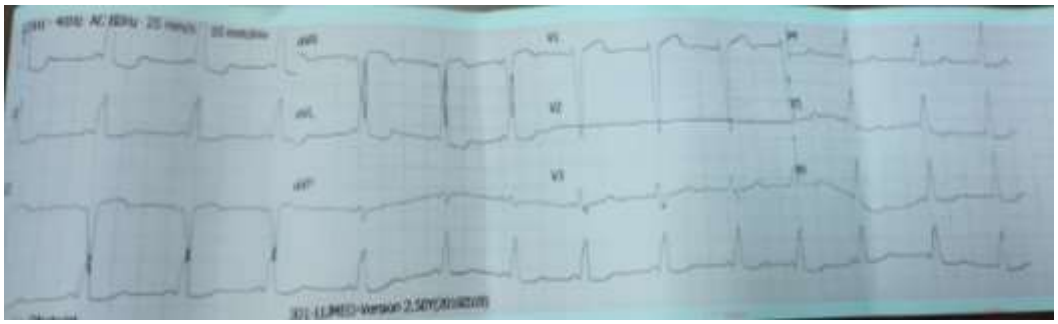

Fig 1. ECG results upon pre-anesthetic evaluation (two hours before surgery)

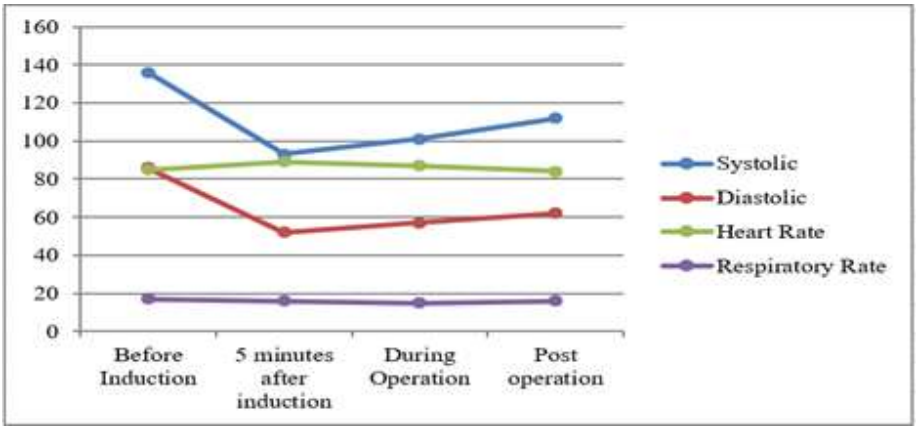

Fig 2. Hemodynamic Intraoperative

Discussion

This case report highlights the clinical management of a 32-year-old female at 40 weeks and 2 days of gestation, with a history of Wolff-Parkinson-White (WPW) syndrome, supraventricular tachycardia (SVT), and a previous cesarean section. WPW syndrome is a rare cardiac condition characterized by the presence of an accessory pathway, leading to abnormal conduction between the atria and ventricles. The typical electrocardiogram (ECG) findings for WPW include a short PR interval, wide QRS complex, and delta waves. These abnormalities can predispose patients to arrhythmias, including PSVT, atrial fibrillation, and ventricular fibrillation, which pose significant risks during pregnancy and the perioperative period (Sudhakar et al., 2022). Pregnancy itself can alter the presentation of arrhythmias, especially in patients with underlying conditions such as WPW syndrome. Hormonal changes, particularly increased estrogen levels, contribute to heightened myocardial excitability. Moreover, physiological changes such as volume overload and increased heart rate due to pregnancy can trigger arrhythmias. Emotional stress, anxiety, and depression, which are common during pregnancy, also play a role in exacerbating tachycardia. These factors complicate the management of arrhythmias in pregnant women, making it crucial for healthcare providers to carefully monitor and treat any signs of tachycardia (Jang et al., 2022).

In this case, the patient was classified as moderate-risk due to her history of arrhythmia. Standard treatment options for WPW syndrome include antiarrhythmic medications such as flecainide or propafenone. However, if medication is ineffective, electrical cardioversion is recommended. An electrophysiological (EP) study and catheter ablation may be considered to reduce arrhythmic risk, though ablation during the first trimester should be avoided unless essential. Despite her history of arrhythmias, the patient was asymptomatic and had a normal echocardiogram, so no pharmacological treatment was administered. The decision to avoid unnecessary therapy is aligned with current guidelines for managing asymptomatic WPW patients during pregnancy (Lee et al., 2022). The management of arrhythmias during pregnancy also involves careful consideration of drug safety. Beta-blockers, though effective for treating tachycardia, may cause significant side effects in early pregnancy, such as delayed intrauterine growth and respiratory depression. These potential risks must be weighed against the benefits of treatment, especially when managing arrhythmias in the context of WPW syndrome. The patient in this case did not receive beta-blockers, further supporting the use of a more conservative approach given her asymptomatic status and the absence of significant arrhythmic events (Sharma et al., 2022).

Preoperative care in patients with WPW syndrome requires a tailored approach to minimize the risk of arrhythmias during surgery. Fluids were carefully managed to avoid hypovolemia-induced tachycardia, which could trigger arrhythmias in the perioperative period. Proper fluid management is

crucial to maintaining hemodynamic stability and preventing conditions that may lead to arrhythmic events. This case illustrates the importance of close monitoring of fluid balance in pregnant women with underlying arrhythmic conditions, ensuring that potential triggers for tachycardia are avoided (Zhou et al., 2022). Anesthesia induction in WPW patients aims to minimize sympathetic activation and maintain stable hemodynamics. The anesthetic agents used must have minimal effects on the accessory pathways of WPW syndrome. In this case, general anesthesia was avoided in favor of regional anesthesia to reduce the risk of sympathetic activation and drug exposure to the fetus. The choice of regional anesthesia, including low-dose bupivacaine with fentanyl, allowed for effective pain management while minimizing the risk of arrhythmias and hemodynamic instability. This approach is recommended for patients with WPW syndrome during cesarean delivery to avoid complications associated with general anesthesia (Rojas et al., 2022).

Spinal anesthesia was chosen for this patient to limit the anesthetic impact on both the mother and fetus. However, one common complication of spinal anesthesia is hypotension, due to sympathetic blockade. In this case, careful titration of the anesthetic dose ensured that hypotension was avoided, maintaining stable hemodynamics throughout the procedure. The use of low-dose bupivacaine combined with fentanyl was successful in achieving a T6 block level without significant complications. This technique has been shown to provide adequate anesthesia while minimizing adverse effects, particularly in patients with arrhythmias (Basu et al., 2023). Combined spinal-epidural anesthesia could also have been considered for this patient. This technique offers the benefit of maintaining hemodynamic stability during the procedure while providing effective postoperative analgesia. Studies have shown that combined spinal-epidural anesthesia can be advantageous for cesarean deliveries in patients with arrhythmias, as it provides better control over sympathetic activation and reduces the need for systemic analgesics, which could exacerbate arrhythmic events. The patient's stable hemodynamic status during the procedure supports the efficacy of this approach in similar cases (Gupta et al., 2022).

During the surgery, oxytocin was administered slowly to manage uterine contractions and prevent postpartum hemorrhage. The use of low-dose oxytocin is recommended to minimize the risk of tachycardia and hypertension, which could aggravate arrhythmias. A dose of 20 IU in 500 cc normal saline over 24 hours was used in this case. Literature suggests that using low doses of oxytocin, especially in the postpartum period, reduces the risk of maternal and fetal complications. This approach is consistent with best practices in the management of patients with WPW syndrome undergoing cesarean delivery (Yang et al., 2023). Postoperatively, multimodal analgesia was implemented to manage pain and prevent sympathetic responses that could trigger arrhythmias. Effective pain management is critical in patients with WPW syndrome, as unaddressed pain can lead to sympathetic overactivation, increasing the risk of arrhythmias such as SVT. The emphasis on multimodal analgesia, which involves using a combination of analgesic agents, ensures that pain is controlled while minimizing adverse effects. This approach aligns with current recommendations for managing pain in patients with arrhythmias, helping to optimize recovery and prevent complications (Chen et al., 2022).

Conclusion

Pregnancy can cause arrhythmias in previously asymptomatic WPW patients due to the physiological changes that occur, such as hormonal fluctuations, increased blood volume, and emotional stress. These changes can increase the risk of arrhythmias, particularly in those with WPW syndrome. Therefore, during anesthesia induction, the primary goal is to maintain hemodynamic stability and prevent factors that may activate the sympathetic nervous system, which could trigger arrhythmic events. Factors such as hypoxia, ischemia, electrolyte imbalance, mechanical stress, and

the stress response to intubation must be carefully managed to avoid complications in patients with WPW syndrome. In these cases, regional anesthesia is the preferred option for cesarean section, as it minimizes the risk of sympathetic activation compared to general anesthesia. Regional anesthesia, particularly spinal or epidural anesthesia, allows for better control of the patient's hemodynamics. The use of low-dose heavy bupivacaine combined with adjuvant fentanyl provides a high-quality block, ensuring effective pain management while maintaining stable blood pressure and heart rate. This approach is particularly beneficial in patients with WPW syndrome, as it reduces the risk of arrhythmias associated with sympathetic stimulation. Postoperative pain management is also critical in preventing sympathetic responses that could exacerbate arrhythmias. In patients with WPW syndrome, unaddressed pain can lead to increased sympathetic activity, which may trigger arrhythmic events such as paroxysmal supraventricular tachycardia (PSVT). Therefore, careful multimodal analgesia should be employed to control pain while avoiding agents that may interfere with the patient's hemodynamic status or trigger arrhythmias. This comprehensive approach to anesthesia and pain management is essential to ensure both maternal and fetal safety during and after a cesarean section in WPW patients.

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