Hemodynamic Stability with Intrathecal Prilocaine 2% in Caesarean Section Patient with Ebstein's Anomaly: A Case Report

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ABSTRACT

Introduction: Ebstein's anomaly is a rare congenital malformation of the tricuspid valve that predisposes pregnant patients to significant hemodynamic instability due to increased circulating volume, cardiac output, and catecholamine levels during pregnancy. Anesthetic management in this population requires careful maintenance of preload, afterload, and sinus rhythm to avoid worsening right-to-left shunting and arrhythmias.

Case Description: A 31-year-old gravida 2 para 1 woman (G2P1001) at 37 weeks of gestation with Ebstein's anomaly type C and severe tricuspid regurgitation who underwent cesarean section due to fetal distress. Spinal anesthesia was performed using hyperbaric prilocaine 2% (80 mg), followed by bilateral ultrasound-guided transversus abdominis plane block for postoperative analgesia. Throughout the 45-minute procedure, the patient maintained stable hemodynamics without episodes of hypotension or arrhythmias. Postoperative recovery in the Obstetric High Dependency Unit remained uneventful, with consistent vital signs and adequate pain control. A healthy neonate was delivered.

Conclusion: This case demonstrates that intrathecal prilocaine 2% can provide effective surgical anesthesia while preserving hemodynamic stability in selected parturients with Ebstein's anomaly. The pharmacological characteristics of prilocaine, rapid onset, intermediate duration, and a favorable sympathetic profile, make it a potential alternative to longer-acting agents in patients at risk of hemodynamic compromise. Further studies are needed to validate its safety and efficacy in parturients with congenital cardiac disease.

Keywords: Caesarean section, ebsteins anomaly, hemodynamic stability, prilocaine, spinal anesthesia

Stabilitas Hemodinamik Prilokain Intratekal 2% pada Seksio Sesarea dengan Anomali Ebstein: Sebuah Laporan Kasus

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ABSTRAK

Pendahuluan: *Anomali Ebstein merupakan kelainan jantung bawaan langka pada katup trikuspid yang dapat menyebabkan ketidakstabilan hemodinamik pada kehamilan akibat peningkatan volume sirkulasi, curah jantung, dan kadar katekolamin. Tatalaksana anestesi pada kondisi ini harus mempertahankan preload, afterload, dan irama sinus untuk mencegah perburukan shunt kanan-kiri dan aritmia.*

Deskripsi Kasus: *Seorang wanita usia 31 tahun, gravida 2 para 1, kehamilan 37 minggu dengan Anomali Ebstein tipe C dan regurgitasi trikuspid berat yang menjalani seksio sesarea karena gawat janin. Anestesi spinal dilakukan menggunakan prilokain hiperbarik 2% (80 mg), diikuti blok transversus abdominis plane bilateral dengan panduan USG untuk analgesia pascaoperasi. Selama prosedur selama 45 menit, pasien mempertahankan stabilitas hemodinamik tanpa episode hipotensi atau aritmia. Pemulihan pascaoperasi di Obstetric High Dependency Unit berlangsung tanpa komplikasi, dengan tanda vital stabil dan kontrol nyeri yang adekuat. Bayi lahir dengan kondisi baik.*

Kesimpulan: *Laporan kasus ini menunjukkan bahwa prilokain intratekal 2% dapat memberikan anestesi pembedahan yang efektif sekaligus mempertahankan stabilitas hemodinamik pada pasien dengan Anomali Ebstein yang dipilih secara tepat. Karakteristik farmakologis prilokain di mana awal kerja cepat, durasi intermediate, dan profil simpatis yang lebih stabil, menjadikannya alternatif yang menjanjikan pada pasien dengan risiko kompromi hemodinamik. Penelitian lebih lanjut diperlukan untuk memastikan keamanan dan efektivitasnya pada populasi ini.*

Kata Kunci: *Anestesi spinal, anomali ebstein, prilokain, seksio sesarea, stabilitas hemodinamik*

INTRODUCTION

Pregnancy induces major cardiovascular adaptations, including increased intravascular volume, elevated cardiac output, enhanced catecholamine release, and reduced systemic vascular resistance. While these physiological responses are generally well tolerated in healthy parturients, they may significantly worsen pre-existing structural heart disease, particularly congenital conditions involving the right heart. Ebstein's anomaly (EA) is a rare congenital malformation characterized by apical displacement of the tricuspid valve leaflets, atrialization of the right ventricle, and varying degrees of tricuspid regurgitation, which predispose patients to arrhythmias, cyanosis, and right-sided volume overload.[1,2] During pregnancy, the increase in blood volume, stroke volume, and heart rate can exacerbate right-to-left shunting and provoke hemodynamic deterioration in patients with EA.[3]

The anesthetic management of pregnant women with EA requires meticulous planning to maintain sinus rhythm, preserve preload and afterload, and avoid abrupt reductions in systemic vascular resistance that may worsen shunting or precipitate cardiovascular collapse.[4,5] Cesarean delivery may be indicated depending on obstetric or hemodynamic considerations, and anesthetic choice becomes critical. While neuraxial anesthesia offers advantages for maternal outcomes, rapid sympathetic blockade may be poorly tolerated in patients with fixed cardiac output or significant valvular dysfunction.[6,7]

Hyperbaric prilocaine 2% has emerged as a promising alternative for spinal anesthesia due to its rapid onset, shorter motor block, faster recovery, and relatively stable hemodynamic profile compared with longer-acting agents such as bupivacaine.[4,8] Clinical evidence suggests that prilocaine provides effective surgical anesthesia while minimizing hypotension, which is particularly beneficial in parturients with congenital heart disease.[9,10] In this case report, we present the anesthetic management of a patient with Ebstein's anomaly undergoing cesarean section using intrathecal prilocaine 2%, highlighting the implications for hemodynamic stability and perioperative safety.

CASE DESCRIPTION

A 31-year-old gravida 2 para 1 woman (G2P1001) at 37 weeks of gestation, with a known history of congenital heart disease since childhood, was admitted for delivery. Her pregnancy had been managed conservatively with planned spontaneous labor under intra-labor analgesia to reduce cardiac workload. However, during labor, the fetus developed signs of distress, and an emergency decision was made to proceed with cesarean section.

On admission, the patient was fully conscious with stable vital signs: blood pressure 131/88 mmHg, heart rate 78 beats/min, respiratory rate 16 breaths/min, temperature 36.7°C, and oxygen saturation 93% on room air. She denied dyspnea, orthopnea, chest pain, or exercise intolerance. Physical examination revealed a grade systolic murmur without peripheral edema or cyanosis. Airway evaluation showed normal mouth opening, intact dentition, and adequate neck flexion.

Laboratory findings demonstrated leukocytosis ($18.01 \times 10^3/\mu L$), mildly elevated SGOT (51.7 U/L), and mild hyperkalemia (5.49 mmol/L), with other hematology, coagulation, and biochemical parameters within normal limits. Electrocardiography showed normal sinus rhythm. Echocardiography revealed Ebstein's anomaly type C with right atrial and atrialized right ventricular dilation, severe tricuspid regurgitation, preserved left ventricular ejection fraction (60.1%), dyskinesia of the mid-inferior and apical septal segments, and an estimated right atrial pressure of 8 mmHg.

She was classified as ASA physical status III with anticipated intraoperative risks including hypotension, arrhythmia, bleeding, and potential cardiac decompensation. The surgical plan was lower-segment cesarean section in the supine position with expected operative duration of 45–60 minutes.

Pre-anesthetic preparation included establishing an 18G intravenous line with Ringer's lactate infusion at 95 mL/hour. In the preoperative area, the patient remained hemodynamically stable (BP 127/74 mmHg; HR 75/min). The anesthesia plan consisted of spinal anesthesia using hyperbaric prilocaine 2% in combination with a transverse abdominis plane (TAP) block

for postoperative analgesia. Under aseptic technique, spinal anesthesia was performed at the L3–L4 interspace with the patient in the left lateral decubitus position. Intrathecal hyperbaric prilocaine 2% (80 mg) was administered following skin infiltration with lidocaine 2%. Following spinal placement, IV oxytocin 10 IU bolus and an additional 20 IU infusion were administered according to obstetric protocol. A bilateral TAP block was performed under ultrasound guidance using 0.375% ropivacaine with 0.5 mg morphine, 20 mL per side, deposited between the internal oblique and transversus abdominis muscle fascia.

Throughout the 45-minute procedure, the patient maintained stable hemodynamics with no episodes of hypotension or arrhythmias. Blood pressure remained within systolic 103–127 mmHg and diastolic 55–76 mmHg, and heart rate between 68–84 beats/min. A healthy neonate was delivered with no intraoperative complications.

Table 1. Hemodynamic profile during procedures in patients

Condition	Date	Time (WITA)	SBP (mmHg)	DBP (mmHg)	MAP (mmHg)	PR (bpm)
Reception room patient	17-03-2023	20 : 05	127	74	92	75
Before the RA BSA regional block (Start of Anesthesia)	17-03-2023	20 : 10	117	74	89	72
After completion of RA BSA regional block	17-03-2023	20 : 20	105	55	80	71
Start Operation	17-03-2023	20 : 23	120	74	88	81
During Operation	17-03-2023	20 : 28	105	55	80	75
	17-03-2023	20 : 33	106	64	80	70
	17-03-2023	20 : 43	107	73	84	78
	17-03-2023	20 : 48	104	69	81	74
	17-03-2023	20 : 53	106	74	85	71
	17-03-2023	20 : 58	106	76	86	73
	17-03-2023	21 : 03	115	70	85	70
Operation Completed	17-03-2023	21 : 05	127	74	92	68
Post Operation (OHDU Observations)	18-03-2023	07 : 21	120	80	93	84
	19-03-2023	06 : 00	120	80	93	84
	20-03-2023	07 : 02	138	88	105	83
	21-03-2023	07 : 48	135	80	98	86
	22-03-2023	06 : 23	134	85	101	89
	23-03-2023	07 : 10	131	83	99	86
Exit OHDU and Obsgyn Polyclinic Treatment	24-03-2023	13 : 44	138	88	104	83

OHDU : Obstetric High Defedency Unit, SBP : Systolic Blood Pressure, DBP : Diastolic Blood Pressure, MAP: Mean Arterial Pressure, PR : Pulse Rate, WITA: Central Indonesia Time, mmHg : Millimetres Of Mercury, bpm: Beats Per Minute

Postoperatively, the patient was managed in OHDU for cardiac monitoring. Analgesia consisted of ketorolac 30 mg IV every 8 hours and paracetamol 500 mg orally every 6 hours. Hemodynamics remained stable during the 5-day observation period, and she was discharged in good condition with follow-up arranged at the obstetric and cardiology clinics. No postoperative complications were observed during hospitalization.

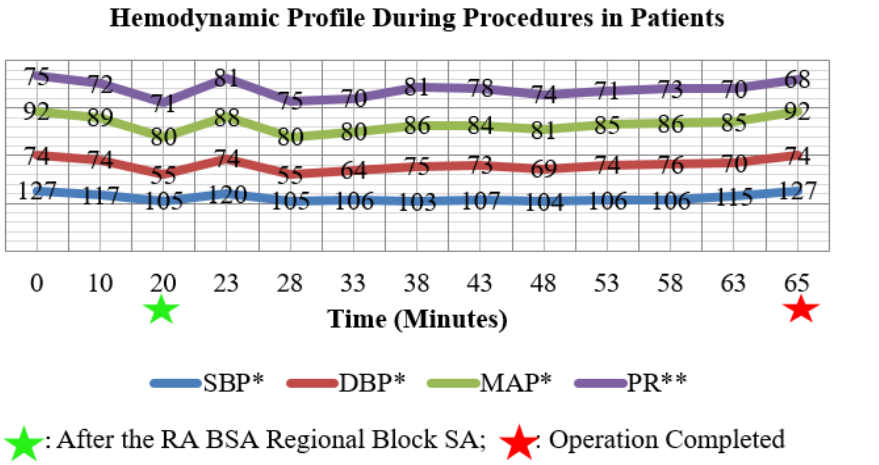

Figure 1. Hemodynamic profile during the procedure on the patient

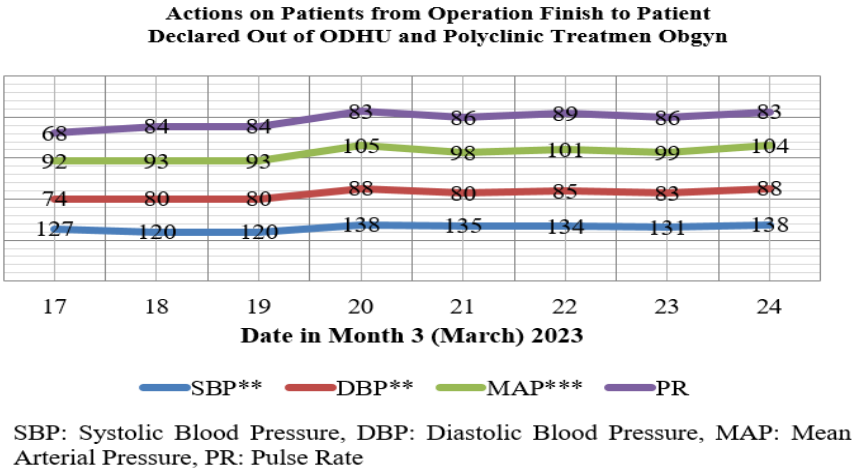

Figure 2. Hemodynamic profile from end of surgery to discharge from OHDU and Obgyn clinic

DISCUSSION

Pregnancy imposes significant cardiovascular demands that can exacerbate pre-existing structural heart diseases, particularly right-sided congenital lesions such as Ebstein's anomaly (EA). The physiological increase in intravascular volume, cardiac output, and circulating catecholamines may worsen tricuspid regurgitation, promote right-to-left shunting, and precipitate arrhythmias in susceptible patients.[2,3] EA is characterized by apical displacement of the tricuspid valve leaflets and atrialization of the right ventricle, resulting in impaired right ventricular function and dilation of the right atrium.[1] In pregnancy, these abnormalities increase the risk of hemodynamic instability, cyanosis, and cardiac decompensation, particularly during labor and delivery.[5]

Anesthetic management for cesarean delivery in EA must therefore be individualized, emphasizing the maintenance of preload and afterload, preservation of sinus rhythm, and avoidance of sudden reductions in systemic vascular resistance that may exacerbate intracardiac shunting.[4] Although general anesthesia remains an option, especially in cases complicated by arrhythmias or anticipated hemodynamic instability, neuraxial techniques are generally

preferred due to superior maternal outcomes and reduced neonatal exposure to anesthetic agents.[6,7] However, traditional spinal anesthesia using long-acting agents such as bupivacaine can produce a profound sympathetic blockade, predisposing patients with congenital heart disease to hypotension and reduced cardiac output.

Hyperbaric prilocaine 2% offers several advantages in this context. It provides a rapid onset of action, reliable surgical anesthesia, shorter duration of motor block, and faster postoperative recovery compared with longer-acting local anesthetics.[10] More importantly, multiple randomized trials have demonstrated that prilocaine is associated with a reduced incidence of maternal hypotension during cesarean delivery compared with bupivacaine, likely due to its milder sympathetic blockade and shorter duration of effect.[11,12] Dose-finding studies also support its safety profile, suggesting that prilocaine offers an optimal balance between surgical anesthesia and hemodynamic stability.[8,9]

In this patient, intrathecal administration of hyperbaric prilocaine 2% (80 mg) resulted in stable intraoperative hemodynamics without episodes of hypotension or arrhythmias. Systolic blood pressure remained within an acceptable range (103–127 mmHg), and heart rate remained stable throughout the procedure. This hemodynamic stability aligns with prior evidence demonstrating that prilocaine maintains cardiac output and vascular tone more effectively than commonly used alternatives in obstetric anesthesia. The use of a TAP block provided effective postoperative analgesia and reduced opioid requirements, consistent with previous studies supporting its role in multimodal analgesia for cesarean delivery.[13]

Oxytocin was administered cautiously due to its well-known vasodilatory effects, which can precipitate hypotension, an important concern in patients with EA. Adherence to evidence-based dosing and titration strategies, as recommended in obstetric anesthesia guidelines, likely contributed to the patient's stable hemodynamic profile.[14] Postoperative monitoring in OHDU is consistent with recommendations for women with congenital heart disease, ensuring early detection of arrhythmias, fluid shifts, or delayed cardiovascular compromise.

Overall, this case demonstrates that intrathecal hyperbaric prilocaine 2% is a viable and hemodynamically favorable option for cesarean delivery in selected patients with EA. Its pharmacological profile appears compatible with the hemodynamic goals required for managing congenital right-sided lesions, particularly when combined with meticulous monitoring and a tailored multimodal analgesic strategy. Further research with larger cohorts is warranted to validate its safety and efficacy in this high-risk population.

CONCLUSION

Intrathecal hyperbaric prilocaine 2% provided effective surgical anesthesia and maintained hemodynamic stability in this patient with Ebstein's anomaly undergoing cesarean section. The agent's rapid onset, favorable sympathetic profile, and shorter duration contributed to the absence of intraoperative hypotension or arrhythmias, key concerns in individuals with right-sided congenital heart disease. This case highlights that prilocaine may serve as a safe and advantageous alternative to longer-acting local anesthetics in selected high-risk parturients, particularly when combined with careful perioperative monitoring and comprehensive multimodal analgesia. Further studies are needed to strengthen the evidence supporting its use in congenital cardiac conditions during pregnancy.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this case report.

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