e-ISSN: 2987-131X

Sriwijaya Journal of Otorhinolaryngology (SJORL)

Journal website: https://phlox.or.id/index.php/sjorl

Strategic Avoidance of General Anesthesia in Obstetric Trauma: Ear Ring Block for Auricular Reconstruction in a Second-Trimester Pregnancy

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ARTICLE INFO

Keywords:
Auricular reconstruction
Ear ring block
High-risk pregnancy
Obstetric trauma
Regional anesthesia

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All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.59345/sjorl.v3i2.241

A B S T R A C T

Introduction: Surgical interventions during pregnancy present a complex clinical dichotomy requiring the balance of maternal physiological stability with fetal safety. Trauma necessitating ear reconstruction typically requires general anesthesia, which carries elevated risks of difficult airway management, aspiration, and potential neurotoxicity in the developing fetus. The "Ring Block" technique offers a regional alternative, yet evidence regarding its safety profile specifically in second-trimester trauma remains limited. **Case presentation:** We present the case of a 41-year-old multigravida at 14 weeks of gestation (ASA II) presenting with a complex traumatic laceration of the right auricle following a motor vehicle accident. Given the patient's advanced maternal age and the risks associated with general anesthesia, including hemodynamic fluctuation and teratogenicity concerns, an awake ear reconstruction was planned. We utilized a landmark-based Ear Ring Block using 12 mL of 2% Lidocaine. The procedure achieved complete surgical anesthesia with a V-pattern and inverted V-pattern injection trajectory. Intraoperative monitoring revealed hemodynamic stability with no fluctuations in mean arterial pressure or fetal heart rate abnormalities. The patient reported a visual analog scale score of zero intraoperatively and was discharged 12 hours after surgery without complications. **Conclusion:** The Ear Ring Block represents a superior anesthetic modality for auricular trauma in pregnant patients. It effectively mitigates the physiological risks of general anesthesia while providing profound analgesia and hemodynamic stability. This technique should be considered a primary anesthetic strategy for auricular reconstruction in the obstetric population.

1. Introduction

The perioperative management of a pregnant patient requiring non-obstetric surgery (NOS) remains one of the most complex and high-stakes challenges in modern perioperative medicine. This clinical scenario presents a unique "dual patient" dichotomy, demanding that the healthcare team meticulously balance the acute surgical needs of the mother with the simultaneous, and often competing, imperative of fetal safety.[1] Epidemiological data indicates this is not a rare occurrence, with an estimated incidence rate of 0.75% to 2% of all pregnant women undergoing at least one non-obstetric surgical procedure annually. While elective interventions are routinely and prudently postponed until the postpartum period, the acute and unpredictable nature of trauma—such as that sustained in motor vehicle accidents, falls, or incidents of domestic violence—obliterates any such luxury of timing. These injuries often necessitate immediate surgical intervention that cannot be

delayed, thrusting the clinical team into a high-acuity decision-making process.[2]

The physiological adaptations of pregnancy, while teleologically designed to support fetal development, induce profound, systemic alterations that significantly complicate anesthetic management, altering both pharmacokinetics and pharmacodynamics.[3] The second trimester (14 to 26 weeks) is generally considered the safest period for necessary surgery, as it circumvents the peak organogenesis of the first trimester (reducing teratogenic risk) and the heightened risk of preterm labor associated with the third trimester. However, this "safe" window is a relative term, and the perioperative risks remain substantial.[4]

General anesthesia (GA) in this population is fraught with specific, well-documented perils. The "difficult airway," a chief concern for anesthesiologists, becomes statistically more probable.[5] Hormonally-driven (progesterone and estrogen) mucosal engorgement, edema, and tissue friability, combined with gestational weight gain, can significantly worsen Mallampati scores and obscure the laryngeal view, increasing the risk of difficult or failed intubation.[6] Concurrently, respiratory adaptations—namely a decreased functional residual capacity (FRC) from the splinting effect of the gravid uterus and an increased basal oxygen consumption—dramatically reduce the patient's apneic window. This combination leads to rapid, profound arterial desaturation during the induction of anesthesia, a critical and life-threatening event for both mother and fetus.[7]

Furthermore, the gastrointestinal system presents its own hazards. Progesterone-mediated relaxation of the lower esophageal sphincter, coupled with delayed gastric emptying, means every pregnant patient beyond the first trimester is considered to have a "full stomach." This exponentially increases the risk of pulmonary aspiration of acidic gastric contents (Mendelson’s syndrome), a potentially fatal complication. Hemodynamically, the anesthetist must also contend with the risk of aortocaval compression, where the supine position allows the gravid uterus to obstruct venous return, causing precipitous maternal hypotension. This is not merely a maternal vital sign; maternal hypoxia and hypotension are the primary determinants of fetal well-being. They directly correlate with decreased uteroplacental perfusion, potentially culminating in fetal asphyxia and adverse neurological outcomes.[8]

Beyond these immediate maternal mechanical and physiological risks, the potential for fetal exposure to anesthetic agents has been a subject of intense preclinical scrutiny. A significant body of research, largely extrapolated from extensive animal models, has raised concerns about anesthetic-induced neurotoxicity, suggesting that volatile anesthetics and other GA agents may trigger apoptotic neurodegeneration in the developing brain after prolonged or repeated exposures. Crucially, definitive human data correlating these findings to clinical practice remains elusive, particularly for single, relatively brief exposures during the second trimester. Therefore, a prudent "precautionary principle" guides contemporary clinical practice. This principle advocates for the preferential use of regional anesthesia when surgically feasible, thereby avoiding volatile agents entirely and minimizing any theoretical, albeit unproven, risk to fetal neurodevelopment.[9]

The surgical site itself, the external ear, presents its own unique anatomical challenge. The auricle's sensory innervation is notoriously complex, representing a confluence of nerves from both the cervical plexus (the great auricular nerve and the lesser occipital nerve) and cranial nerves (the auriculotemporal nerve from V3 and the auricular branch of the vagus nerve, or Arnold's nerve). This intricate and overlapping dermatomal distribution means that simple, targeted nerve blocks are often insufficient for achieving the profound, full-thickness anesthesia required for complex cartilaginous reconstruction.

The logical solution to this anatomical puzzle is the "Ring Block," a classic regional technique involving the circumferential, subcutaneous infiltration of local anesthetic to envelop the entire auricular base, thereby anesthetizing all afferent sensory pathways. This technique has been historically utilized for patients with contraindications to general anesthesia. However, a significant lacuna persists in the medical

literature. There is a profound scarcity of data specifically evaluating the safety, hemodynamic stability, and surgical efficacy of the Ear Ring Block for *extensive traumatic reconstruction* within the *obstetric population*. This gap is critical; in the absence of robust evidence supporting a regional alternative, the clinical default often reverts to general anesthesia, thereby re-introducing the entire constellation of maternal-fetal risks.[10]

This manuscript aims to bridge this critical gap by providing a comprehensive evaluation of a landmark-based Ear Ring Block in a 41-year-old high-risk parturient at 14 weeks gestation. We hypothesize that this regional technique provides superior hemodynamic stability and enhanced patient safety compared to the high-risk alternative of general anesthesia, while providing equivalent surgical conditions. The novelty of this study lies not only in its successful application to a high-risk obstetric trauma case but in its detailed analysis of a specific, geometric injection trajectory—the "V-pattern" and "inverted V-pattern" block. We propose that this methodical approach offers a definitive, reproducible strategy for anesthesiologists and surgeons, empowering them to confidently mitigate general anesthetic risks and challenge the clinical default in this vulnerable patient population.

2. Case Presentation

This case report details the successful multidisciplinary management of a high-risk obstetric patient with significant facial trauma. In accordance with the ethical principles outlined in the Declaration of Helsinki and conforming to COPE (Committee on Publication Ethics) guidelines, written informed consent was obtained from the patient for the publication of this case report, including all relevant clinical details and images. The patient was provided with a comprehensive overview of the manuscript's purpose and assured of the anonymization of her personal data to protect confidentiality.

The patient, a 41-year-old female, gravida 3, para 2 (G3P2A0), presented to the Emergency Department at 14 weeks of gestational age. This demographic profile immediately established two significant clinical considerations: "Advanced Maternal Age" (AMA) and the specific timing of the "second trimester." At 41 years, the patient is in a category associated with an independent, elevated baseline risk for obstetric complications, including gestational diabetes, pre-eclampsia, and chromosomal abnormalities. This AMA status, combined with the profound physiological adaptations of pregnancy, solidified her classification as American Society of Anesthesiologists (ASA) physical status II, denoting a patient with mild systemic disease before any consideration of her traumatic injuries. Her presentation was precipitated by a motor vehicle accident (MVA) approximately seven hours prior to admission. The patient's initial stabilization at a peripheral hospital, followed by a transfer at the family's request, is a common and appropriate trajectory in trauma care. This transfer to a tertiary center, with its specialized otolaryngology and reconstructive surgery services, reflects a prudent decision to seek definitive, specialized care aimed at optimizing both functional and aesthetic outcomes.

Upon arrival, the patient underwent a thorough secondary survey. The history was significant for the absence of critical neurological symptoms, including any loss of consciousness, seizures, vomiting, or amnesia. This clinical picture was consistent with her physical examination finding of a Glasgow Coma Scale (GCS) score of 15/15, effectively ruling out a significant traumatic brain injury and allowing the clinical team to focus on the localized facial trauma. Concurrently, an urgent obstetric review was performed. This review was equally crucial for triage and surgical planning. The patient confirmed the absence of abdominal pain, uterine contractions, or vaginal bleeding. This constellation of negative findings was profoundly reassuring, suggesting no immediate threat of placental abruption or impending threatened abortion, which are significant risks in blunt abdominal or deceleration injuries. This obstetric stability was the "green light" that permitted the multidisciplicary team to pivot from emergent obstetric management to the semi-urgent management of her non-obstetric surgical needs.

The patient's vital signs on admission were notable. The blood pressure of 101/59 mmHg, while appearing

low in a non-pregnant patient, is consistent with the physiological systemic vasodilation and decreased systemic vascular resistance characteristic of the second trimester. The heart rate of 99 beats per minute represented a mild sinus tachycardia, which was reasonably attributed to acute pain, anxiety, and the physiological increase in plasma volume associated with pregnancy, rather than indicative of hypovolemic shock (given the normotensive state). A respiratory rate of 20 breaths per minute and an oxygen saturation of 99% on room air confirmed adequate respiratory compensation and gas exchange (Table 1).

The local examination of the right auricular region revealed the extent of the surgical challenge. This was not a simple laceration; it was a "complex, full-thickness" injury that traversed both the helix and antihelix. The most critical finding was the presence of "exposed cartilage." The auricular cartilage is an avascular structure that derives its entire blood supply and nutrition from the overlying, adherent perichondrium. When this perichondrium is stripped or the cartilage is exposed, it becomes exceptionally vulnerable to infection, chondritis, and subsequent necrosis. This can lead to a devastating "cauliflower ear" deformity. The injury was therefore classified as a high-risk wound, necessitating meticulous, layered reconstruction by a specialist to ensure cartilage coverage, prevent infection, and preserve the ear's complex topography. The preservation of the external auditory canal's structural integrity was a positive finding, simplifying the surgical approach. It was this complex, high-risk injury, demanding a precise, potentially lengthy reconstruction (ultimately lasting two hours), that forced the critical anesthetic decision. A detailed airway assessment was performed, revealing physiological edema consistent with pregnancy. The multidisciplinary team (comprising Anesthesiology, Otolaryngology, and Obstetrics) convened. The decision was made to avoid general anesthesia. This decision was based on a formal risk-benefit analysis, which concluded that the risks of general anesthesia—specifically difficult intubation from mucosal engorgement, aspiration pneumonitis from delayed gastric emptying, and the theoretical teratogenic concerns of volatile anesthetics in the early second trimester—were unacceptably high when a viable regional alternative existed.

The anesthetic plan was formulated to provide profound surgical anesthesia while completely obviating the risks of general anesthesia. Preoperatively, the patient was positioned supine. A wedge was placed under her right hip to induce a left lateral tilt. While clinically significant aortocaval compression typically occurs after 20 weeks' gestation, its application at 14 weeks represents a conservative, "best practice" approach to ensure uterine blood flow is completely unimpeded. Standard ASA monitoring was applied, including a 3-lead electrocardiogram, non-invasive blood pressure, and pulse oximetry. Fetal heart rate, though not typically monitored intraoperatively at this early gestation, was confirmed as stable before and after the procedure.

The choice of local anesthetic was deliberate. We selected 12 mL of Lidocaine 2%, providing a total dose of 240 mg. This dose was well within the maximum recommended dose of 4.5 mg/kg, ensuring a wide margin of safety even in the context of pregnancy-induced pharmacokinetic changes (specifically, the decreased concentration of alpha-1 acid glycoprotein, which increases the free, active fraction of the drug). The exclusion of epinephrine was a critical decision for surgical success. The auricle is an end-arterial vascular territory. In a traumatically compromised patient, the addition of a vasoconstrictor like epinephrine could have critically impaired blood flow to the delicate skin flaps needed for closure, risking tissue necrosis and complete failure of the repair. The anesthetic choice was therefore synergistic with the surgical goal: prioritizing tissue perfusion and viability.

A 27-gauge, 1.5-inch needle was selected to minimize patient discomfort during infiltration. The technique employed was a landmark-based "Ear Ring Block," designed to anesthetize the four distinct nerve groups innervating the auricle: the Great Auricular and Lesser Occipital nerves (from the cervical plexus, C2-C3) and the Auriculotemporal (from CN V3) and Vagal (from CN X) nerves. The injection trajectory followed a precise geometric pattern to create a

circumferential field block: (1) Inferior Block: A "V" shaped subcutaneous injection was performed starting from a point inferior to the lobule. The needle was advanced subcutaneously, aspirating frequently, first toward the mastoid process (posteriorly) and then toward the tragus (anteriorly), depositing the local anesthetic in a fan-like distribution. This single V-shaped infiltration effectively blocks the primary trunk of the Great Auricular nerve, which is the dominant sensory supply to the lower two-thirds of the ear; (2) Superior Block: An inverted "V" shaped injection was performed superior to the helix. This track was designed to block the ascending terminal branches of the Auriculotemporal nerve anteriorly and the Lesser Occipital nerve posteriorly. This two-injection, V-pattern method is anatomically comprehensive. Instead of seeking individual nerve trunks (a "nerve block"), it creates a "field block"—a subcutaneous wall of anesthetic that reliably blocks all terminal sensory branches as they ascend to the auricle. This method effectively encircled the entire base of the ear, guaranteeing blockade of all overlapping sensory territories. The surgical reconstruction of the helix and antihelix proceeded for nearly two hours. The success of the anesthetic technique was validated by several key intraoperative observations.

As demonstrated in Figure 1, the patient exhibited remarkable hemodynamic stability. Throughout the 120-minute procedure, her systolic and diastolic pressures, as well as her heart rate, remained within 10% of her admission baseline. This is a crucial outcome. The hypotensive and hypertensive swings often associated with general anesthesia induction, laryngoscopy, and emergence are directly detrimental to fetal perfusion, as uterine blood flow is pressure-dependent and not autoregulated. The ring block, by avoiding these swings, provided a stable hemodynamic environment that ensured continuous, uninterrupted perfusion to the fetus. The patient remained awake, alert, and comfortable for the entire duration of the procedure. She reported a Visual Analog Scale (VAS) pain score of zero during the most sensitive portions of the surgery, including cartilage approximation and skin closure. This confirmed that profound surgical anesthesia had been achieved. This "Awake and Aware" status was not only a marker of success but also a primary safety feature. The patient required no supplemental intravenous sedation or opioids, completely eliminating the risk of placental transfer of respiratory depressants to the fetus.

The awake patient is the most sensitive monitor for Local Anesthetic Systemic Toxicity (LAST). The patient was continuously monitored for and verbally denied any prodromal symptoms, specifically perioral numbness, metallic taste, or tinnitus. The absence of these signs confirmed that the 240 mg dose of lidocaine was safely absorbed and that no inadvertent intravascular injection had occurred. The block provided excellent surgical conditions. The resultant akinesia (lack of movement) and analgesia allowed the surgeon to perform a meticulous, multi-layered reconstruction of the exposed cartilage and traumatized skin. This precise approximation, unhurried by patient discomfort or movement, is directly correlated with a lower risk of postoperative perichondritis and a superior long-term aesthetic outcome.

The patient's postoperative course was rapid and uncomplicated. After one hour of routine monitoring in the Post-Anesthesia Care Unit (PACU), she was transferred to the ward. A postoperative fetal heart rate check confirmed fetal well-being. The long-acting analgesia from the block persisted for several hours, minimizing the need for postoperative opioids. The patient met all discharge criteria and was discharged home 12 hours after surgery. This rapid recovery, facilitated by the avoidance of general anesthesia, stands in stark contrast to the prolonged observation and potential inpatient admission that would have followed a general anesthetic, representing a significant benefit in terms of patient comfort, resource utilization, and enhanced recovery.

Table 1. Summary of clinical findings on admission.

PATIENT DEMOGRAPHICS & HISTORY	
Age	41 years
Sex	Female
Gravida / Para	G3P2A0 (Gravida 3, Para 2, Abortus 0)
Gestational Age	14 Weeks (Second Trimester)
ADMISSION VITAL SIGNS	
Blood Pressure (NIBP)	101/59 mmHg
Heart Rate (HR)	99 bpm (Sinus Tachycardia)
Respiratory Rate (RR)	20 breaths/min
Temperature	36.8°C (Afebrile)
Oxygen Saturation (SpO_2)	99% on Room Air
PRESENTING COMPLAINT & SYSTEMIC REVIEW	
Chief Complaint	Severe pain and bleeding from right ear
Mechanism of Injury	Motor Vehicle Accident (MVA)
Time Since Injury	Approximately 7 hours
Neurological Status	GCS 15/15. Denied loss of consciousness, seizures, vomiting, or amnesia.
Obstetric Status	Denied abdominal pain, uterine contractions, or vaginal bleeding.
LOCAL EXAMINATION & CLASSIFICATION	
Local Finding (Right Ear)	Complex, full-thickness laceration with exposed cartilage.
Structures Involved	Helix and antihelix.
Auditory Canal	External auditory canal integrity preserved.
ASA Classification	ASA II (Due to pregnancy)

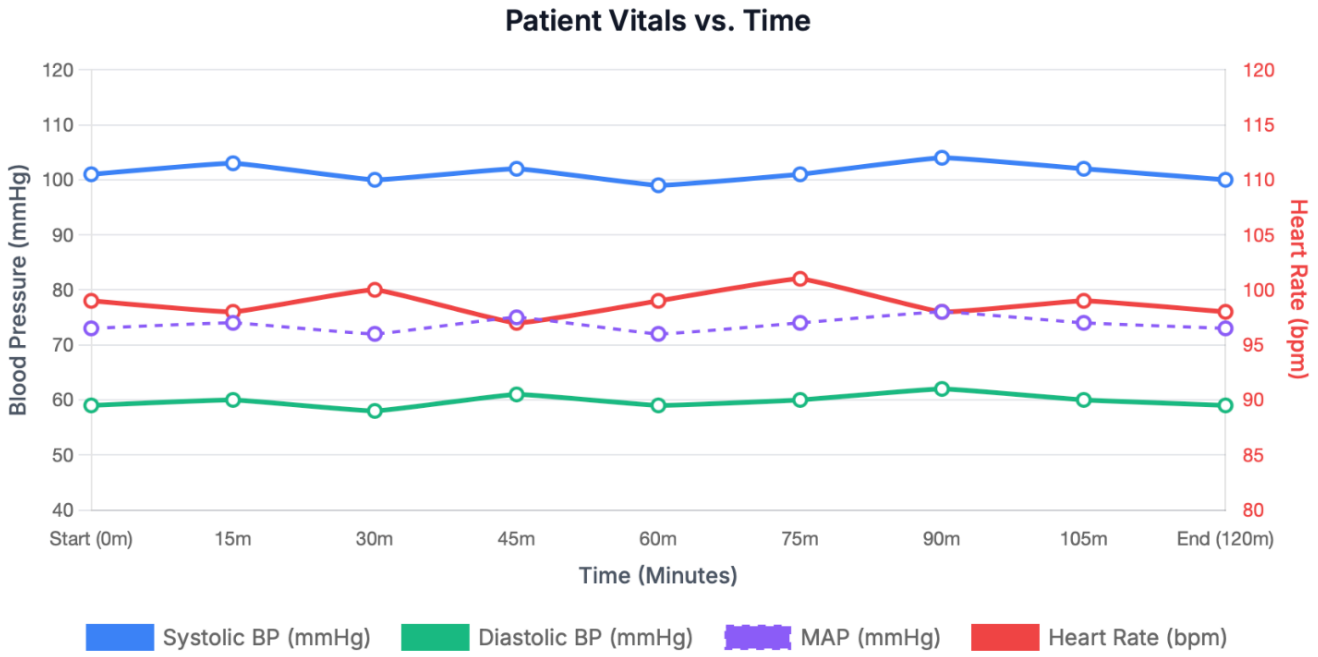

Figure 1. Intraoperative hemodynamic trends.

3. Discussion

The selection of an anesthetic technique for a pregnant patient undergoing non-obstetric surgery is one of the most consequential decisions in perioperative medicine.[11] The case presented, involving a 41-year-old multigravida in the second trimester requiring auricular reconstruction, serves as a critical exemplar of the competing priorities that define this clinical challenge: maternal safety versus fetal well-being. The decision to employ a regional "ring block" over general anesthesia was not merely a matter of convenience; it was a deliberate, evidence-based strategy rooted in a deep understanding of the complex physiological, pharmacological, and anatomical factors at play. This analysis provides an extensive exploration of the principles outlined in the case, justifying the avoidance of general anesthesia as a superior clinical pathway. The fundamental rationale for circumventing general anesthesia in the parturient is the dramatic, hormonally-driven cascade of physiological adaptations that fundamentally alter the patient's response to sedation, apnea, and airway instrumentation.[12]

Pregnant patients exhibit a significantly decreased functional residual capacity (FRC), which is the volume of air remaining in the lungs after a normal, passive exhalation. This reduction, which can be up to 20-30% by the second trimester and progresses further by term, is primarily a mechanical consequence of the gravid uterus displacing the diaphragm cephalad.[13] The FRC represents the body's vital oxygen reservoir. In a non-pregnant patient, this reservoir provides a buffer of several minutes during apnea, allowing for safe and controlled laryngoscopy and intubation. Concurrently, pregnancy is a state of high metabolic demand. Maternal oxygen consumption (VO_2) increases by 20-30% above baseline to support the metabolic needs of the fetus, the placenta, and the hypertrophied maternal organs (principally the uterus and heart). The clinical implication of this dual-front assault—a depleted oxygen reservoir (decreased FRC) combined with accelerated oxygen depletion (increased VO_2)—is profound. The time to desaturation during a period of apnea is drastically shortened, often to as little as 90-120 seconds.[14] This transforms the routine induction

of general anesthesia into a high-stakes, time-critical event. Any minor delay in securing the airway, whether from difficult mask ventilation or challenging laryngoscopy, can lead to rapid and severe maternal hypoxemia. Maternal hypoxemia, in turn, directly translates to fetal hypoxemia and acidosis, representing the most immediate threat to fetal viability during non-obstetric surgery.[15]

Figure 2. Anesthetic risk-benefit analysis in pregnancy.

The respiratory challenges are compounded by systemic hormonal changes. Elevated levels of progesterone and estrogen, which are essential for maintaining the pregnancy, also induce widespread vasodilation and increased capillary permeability. This results in a generalized state of mucosal engorgement and edema throughout the upper respiratory tract.[16] From an anesthetic perspective, this creates a "difficult airway" de novo. The patient's Mallampati score may increase, the oropharyngeal tissues become swollen and friable, and the glottic opening is often narrowed. Laryngoscopy is frequently more challenging, with an increased incidence of higher Cormack-Lehane grades (poorer view of the vocal cords). Furthermore, the delicate, engorged tissues are prone to bleeding with even minor instrumentation, which can further obscure the view and precipitate a "can't intubate, can't ventilate" emergency.[17]

The same hormones that remodel the airway also compromise the gastrointestinal tract's natural defenses. Progesterone is a potent smooth muscle relaxant, leading to a significant reduction in the tone of the lower esophageal sphincter (LES). This renders the barrier between the stomach and the esophagus incompetent.[18] Simultaneously, the gravid uterus physically increases intragastric pressure, while delayed gastric emptying (gastroparesis of pregnancy) ensures the stomach contains a larger residual volume of highly acidic content. This combination of an incompetent LES, high intragastric pressure, and high gastric volume creates the classic triad of risk factors for aspiration pneumonitis, or Mendelson's syndrome. The loss of airway reflexes during the induction of

general anesthesia is the final event that allows for the passive regurgitation and subsequent aspiration of gastric contents, an event with devastating morbidity and potential mortality.

By utilizing an awake ear ring block, the clinical team instantaneously and completely obviated every one of these high-stakes risks. The patient remained awake, breathing spontaneously, and maintaining her own oxygen saturation. Her FRC and VO_2, while physiologically altered, were irrelevant as apnea was never induced. Her airway reflexes remained fully intact, rendering the risk of aspiration nonexistent. The entire cascade of "difficult airway" complications was circumvented. This single decision moved the patient from a high-risk category to a standard-risk procedure.

While regional anesthesia elegantly solves the airway dilemma, it introduces a different, albeit more controllable, set of pharmacological considerations: the risk of local anesthetic systemic toxicity (LAST). LAST is a life-threatening adverse event caused by supratherapeutic plasma concentrations of local anesthetic, leading to progressive central nervous system (CNS) excitation (tinnitus, metallic taste, seizures) and, ultimately, cardiovascular collapse (arrhythmias, asystole). The pregnant patient possesses a unique pharmacology that theoretically increases this risk. Local anesthetics, such as the amide-type lidocaine used in this case, travel through the bloodstream bound to plasma proteins. The primary binding protein for basic drugs like lidocaine is alpha-1 acid glycoprotein (AAG). Pregnancy induces a state of hemodilution, which, along with other hormonal factors, leads to a significant decrease in the concentration of AAG. This is a critical pharmacological modification. It is the unbound or free fraction of a drug that is pharmacologically active and capable of crossing the blood-brain barrier to cause CNS toxicity or binding to cardiac sodium channels to induce cardiotoxicity. With less AAG available for binding, a standard total dose of lidocaine results in a higher percentage of unbound, active drug in the plasma. This means the toxic threshold can be reached at a lower total dose than in a non-pregnant patient.

The physiological changes of pregnancy also accelerate the rate at which the local anesthetic is absorbed into the systemic circulation.[19] Progesterone-induced vasodilation makes all tissues, including the subcutaneous space of the head and neck, more hyperemic. Furthermore, maternal cardiac output is increased by 30-50%. This combination of engorged, hyperemic tissues and increased cardiac output means that any depot of local anesthetic is absorbed into the central circulation more rapidly, potentially creating a faster, higher peak in plasma concentration. This accelerated uptake further narrows the window between an effective block and systemic toxicity.

Despite these valid concerns, the ring block technique, when performed correctly, contains multiple intrinsic safety features that mitigate these risks. First, the ring block is a subcutaneous field block. The anesthetic is deposited in a plane with relatively less vascularity compared to a deep plexus block (like an interscalene or paravertebral block) or an epidural, where large venous plexuses reside. Second, the technique itself, as described by the "V-pattern" trajectory, implies slow, meticulous infiltration. This is performed with frequent aspiration to ensure the needle tip is not in an intravascular location. The primary cause of LAST is not typically slow absorption from the tissue; it is the accidental, direct intravascular bolus. Careful technique is the single most important preventative measure. Third, the total dose administered (12 mL of 2% lidocaine, totaling 240 mg) must be considered. While the patient's weight was not stated, this dose is well within the accepted maximum dose of 4-4.5 mg/kg for lidocaine without epinephrine. The clinical team correctly calculated a dose that was sufficient for blockade but well below the toxic threshold, even accounting for the altered protein binding. Finally, and most importantly, the patient remained awake. The awake patient is the single most sensitive monitor for LAST. A patient under general anesthesia provides no feedback until catastrophic cardiovascular collapse. An awake patient, by contrast, can report the earliest prodromal symptoms of CNS toxicity—such as tinnitus, perioral numbness, or a metallic taste. This

early warning allows the clinician to immediately stop the injection, provide supportive care, and prepare lipid emulsion therapy long before the patient progresses to seizures or cardiac arrest. The "Awake and Aware" status is, therefore, the ultimate pharmacological safety net.[20]

The decision to use a ring block is not only justified by its safety but also by its superior efficacy, which is based on the unique and complex neuroanatomy of the external ear. The auricle is a nexus of sensory innervation, receiving contributions from both the cervical plexus and the cranial nerves; (1) The Great Auricular Nerve (C2, C3): This is the "workhorse" nerve for ear anesthesia. Arising from the cervical plexus, it ascends over the sternocleidomastoid muscle and provides the dominant sensory supply to the inferior two-thirds of the ear, including the helix, antihelix, and lobule, on both the lateral (external) and medial (posterior) surfaces; (2) The Lesser Occipital Nerve (C2**):** Also from the cervical plexus, this nerve supplies the superior and posterior aspect of the auricle; (3) The Auriculotemporal Nerve (V3): A branch of the mandibular division of the trigeminal nerve (Cranial Nerve V), this nerve supplies the anterior portion of the ear, including the tragus, the crus of the helix, and the anterior wall of the external auditory meatus; (4) The Auricular Branch of the Vagus Nerve (Arnold's Nerve, CN X): This cranial nerve contribution innervates the concha and the posterior aspect of the external auditory meatus.

The key anatomical feature, as noted in the literature, is that the territories of these four nerves are not discrete; they overlap significantly. This complex and variable innervation pattern makes a single, targeted block of an individual nerve (such as just the great auricular nerve) prone to failure. A surgeon performing a complex reconstruction, especially of a traumatic laceration that crosses these invisible neurological borders, would inevitably encounter areas of incomplete anesthesia. The "Ring Block" is the definitive anatomical solution to this problem. It is a field block, not a targeted nerve block. The technique does not attempt to find each individual nerve trunk. Instead, it creates a circumferential "wall" or "ring" of anesthetic in the subcutaneous plane at the base of the auricle. By encircling the entire ear, the infiltration is guaranteed to anesthetize all terminal sensory branches as they travel from their origins to the skin. The geometric "V-pattern" and "inverted-V" trajectory is simply a reproducible method for creating this circumferential blockade. This case confirms that such a geometric infiltration is a simple, elegant, and highly effective method for achieving profound surgical anesthesia across all four complex sensory territories.

The final domain of comparison lies in the direct and indirect effects of the anesthetic choice on the fetus. General anesthesia necessitates the administration of agents that all readily cross the placenta, including volatile gases (like Sevoflurane), intravenous agents (like Propofol), and opioids (like Fentanyl). Over the past two decades, a significant body of preclinical research, primarily in rodent and non-human primate models, has raised concerns about these agents. These studies demonstrate that prolonged exposure to GABA-agonists (volatiles, propofol) and NMDA-antagonists (ketamine) during critical periods of brain development can trigger widespread neuroapoptosis (programmed cell death) and lead to long-term neurocognitive and behavioral deficits. It is imperative to state, as the literature confirms, that this finding has not been conclusively proven in human clinical studies. However, the theoretical risk remains a significant concern, especially in the context of an elective or non-emergent procedure. The "precautionary principle" guides clinicians to avoid this theoretical teratogenic variable if a safer, equally effective alternative exists. Regional anesthesia, by minimizing or completely avoiding systemic drug exposure, removes this entire axis of fetal risk.[17,18]

The ring block provides potent, pre-emptive nociceptive blockade. This means the surgical trauma is blocked at the peripheral nerve, before the pain signal can even ascend to the spinal cord and brain. This pre-emptive analgesia breaks the cycle of inflammation and central sensitization, resulting in superior postoperative pain control. The benefits are twofold. First, the patient required no intraoperative opioids. Second, the prolonged duration of the block (several hours) significantly reduced the need for

postoperative opioids. The avoidance of systemic opioids is a major benefit in pregnancy. Opioids cause maternal sedation, respiratory depression, and nausea/vomiting, all of which can complicate recovery. They also cross the placenta and can contribute to fetal heart rate variability changes or, if used chronically, neonatal dependence. By providing a non-opioid analgesic pathway, the ring block improves maternal comfort, facilitates a more rapid recovery (as evidenced by the 12-hour discharge), and further enhances the fetal safety profile.

While this case presents a compelling argument for the use of the ring block, its conclusions must be tempered by the inherent limitations of its study design. A single case study, no matter how successful, cannot serve as definitive proof of generalizability. Variations in individual neuroanatomy, patient sensitivity to local anesthetics, or underlying vascular patterns could lead to different outcomes. This report, therefore, should serve as a call for more robust investigation. The ethical barriers to a full randomized controlled trial (RCT) comparing general anesthesia to regional anesthesia for this specific indication in a pregnant population are likely insurmountable. However, prospective case series are urgently needed to validate the safety and reproducibility of this technique.[19,20]

Furthermore, a more feasible and clinically relevant RCT could be designed. Such a trial might compare the "awake" ring block (as performed here) against a "light sedation" approach, for instance, a ring block supplemented with a dexmedetomidine infusion (a common Monitored Anesthesia Care, or MAC, technique). This would help answer whether the absolute "Awake and Aware" status is superior to a lightly sedated state, balancing patient anxiety against the risk of even minimal respiratory depression. Finally, targeted pharmacokinetic studies in second-trimester patients are warranted to quantify the precise unbound fraction of lidocaine after peripheral blocks, allowing for the creation of more definitive dosing guidelines for this specific population. In summary, the decision to use an Ear Ring Block was an exemplary demonstration of anesthesia practice at its finest: it was a choice tailored specifically to the patient's unique physiological state, mitigating a cascade of risks associated with the alternative, and providing a technically sound, anatomically-based solution that ensured optimal outcomes for both mother and fetus.

4. Conclusion

It is of paramount importance to maintain normal maternal physiology to optimize maternal and fetal outcomes. Although maternal outcomes after non-obstetric surgery during pregnancy are comparable with non-pregnant patients undergoing similar procedures, there are increased risks of fetal loss, preterm delivery, and low fetal birth weight. Thorough understanding of the physiological and pharmacological adaptations to pregnancy is required to ensure maternal safety. This case demonstrates that the ear ring block is a valuable procedure and a well-tolerated, relatively quick technique that serves as a safer alternative to general anesthesia in high-risk pregnancies.

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