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Spinal Anesthesia for Emergency Cesarean Section in a Parturient with Coexisting Myasthenia Gravis, Ankylosing Spondylitis, and Multiple Sclerosis: A Rare Case Report and Structured Anesthetic Approach

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ABSTRACT

Introduction: The simultaneous occurrence of myasthenia gravis, ankylosing spondylitis, and multiple sclerosis in a pregnant woman requiring emergency cesarean section is exceptionally rare and, to our knowledge, has not previously been documented. These autoimmune disorders impose overlapping neuromuscular, demyelinating, and axial-skeletal constraints that interact to make peripartum anesthetic decision-making uniquely hazardous.

Case Presentation: A 34-year-old multiparous woman with a five-year history of myasthenia gravis, ankylosing spondylitis, and multiple sclerosis presented at 30 weeks' gestation with premature rupture of membranes, irregular contractions, and reduced fetal movement, alongside ptosis, diplopia, dysphagia, dysarthria, dysphonia, dyspnea, and limb weakness. She was maintained on pyridostigmine, methylprednisolone, and adalimumab with pregnancy-adjusted dosing. After multidisciplinary evaluation, emergency cesarean section was performed under single-shot spinal anesthesia using 0.5% bupivacaine 10 mg with fentanyl 25 mcg at L4-L5 via a 27-gauge Quincke needle in a single, uncomplicated pass, with a difficult-airway cart and rocuronium-sugammadex prepared as contingency. Hemodynamics remained stable apart from a transient rise in respiratory rate that resolved with oxygen. A preterm female infant weighing 1,415 g was delivered with Apgar scores of 5, 7, and 8. Mother and infant were monitored in intensive care; the mother reached the ward on postoperative day one without myasthenic crisis.

Conclusion: Pregnancy with three coexisting autoimmune diseases generates synergistic, not merely additive, anesthetic risk. Carefully conducted spinal anesthesia, supported by multidisciplinary planning, disease-tailored drug selection, and a staged airway-rescue plan, achieved a safe outcome and offers a transferable framework for comparable emergencies.

1. Introduction

Pregnancy in a woman with a single autoimmune disease already demands careful multidisciplinary planning, but the convergence of several autoimmune disorders in one parturient magnifies the complexity of care in ways that are not simply additive. When more than one organ system is affected, the physiological adaptations of pregnancy interact with each disease process and with the drugs used to treat it, so that a therapeutic decision that is safe in isolation may become hazardous in combination. The coexistence of myasthenia gravis, multiple sclerosis, and ankylosing spondylitis in the same pregnant patient exemplifies this

problem at its most extreme, because it superimposes a disorder of neuromuscular transmission, a disorder of central nervous system myelin, and a disorder of the axial skeleton upon the already altered maternal physiology of late gestation.

Myasthenia gravis is an antibody-mediated disorder of the neuromuscular junction characterized by fatigable weakness that worsens with sustained activity. Its estimated prevalence is in the region of 150 to 250 cases per million population, and it affects women roughly twice as often as men, with a characteristic early peak in the reproductive years that makes its intersection with pregnancy clinically important.[1] The disease arises from autoantibodies directed against the nicotinic acetylcholine receptor, or against functionally related molecules such as muscle-specific kinase, which reduce the number of available postsynaptic receptors and thereby degrade the safety margin of neuromuscular transmission.[2] Acetylcholinesterase inhibitors, of which pyridostigmine is the mainstay because it does not cross the blood-brain barrier and produces comparatively mild muscarinic effects, form the symptomatic foundation of treatment, frequently supplemented by corticosteroids and other immunotherapies.[2] The physiological shifts of pregnancy, including altered drug absorption, expanded plasma volume, and increased renal clearance, can disturb the delicate balance of anticholinesterase dosing, while the disease itself is associated with higher rates of miscarriage, preterm delivery, and maternal morbidity, and with the ever-present threat of myasthenic or cholinergic crisis.[3,4]

Ankylosing spondylitis is a chronic inflammatory rheumatic disease of the axial skeleton, dominated by inflammatory back pain, progressive spinal stiffness, and, in advanced disease, bony ankylosis. Reported prevalence figures range from roughly 7 to 32 per 10,000 individuals, and the condition is strongly associated with the human leukocyte antigen B27 allele, although its pathogenesis also involves dysregulated interleukin-17 and interleukin-23 signaling and an intimate relationship between inflammation and new bone formation.[5,6] For the pregnant woman, the disease introduces three distinct hazards during labor and delivery: mechanical difficulty of vaginal birth and instrumental delivery owing to pelvic and hip involvement; technical difficulty of neuraxial anesthesia because of ligamentous calcification and narrowing of the intervertebral spaces; and difficulty with general anesthesia because of restricted cervical mobility and consequently compromised airway access.[7,8]

Multiple sclerosis is a chronic autoimmune disease of the central nervous system characterized by inflammatory demyelination, gliosis, and axonal loss, producing neurological disability that accumulates over time. It most commonly follows a relapsing-remitting course, accounting for the majority of cases, in which discrete attacks are followed by partial or complete recovery, but a proportion of patients progress steadily.[9] Environmental triggers such as infection, psychological stress, and elevated body temperature can precipitate relapses, and the clinical spectrum includes motor weakness, visual disturbance, ataxia, sphincter dysfunction, and affective lability.[10] Historically, neuraxial anesthesia was approached with caution in multiple sclerosis because of a theoretical concern that local anesthetics might exert neurotoxic effects on demyelinated axons; contemporary evidence, however, indicates that neuraxial techniques, and spinal anesthesia for cesarean section in particular, can be performed safely, with no consistent signal of increased relapse or disability attributable to the anesthetic itself.[10,11]

Each of these three diseases independently complicates obstetric anesthesia, but their simultaneous presence creates a set of interacting, synergistic risks that must be reconciled within a single anesthetic plan. The neuromuscular vulnerability of myasthenia gravis raises the stakes of any decision involving muscle relaxants or magnesium; the demyelination of multiple sclerosis heightens theoretical susceptibility to local anesthetic neurotoxicity; the axial rigidity of ankylosing spondylitis simultaneously obstructs neuraxial access and predicts a difficult airway should conversion to general anesthesia become necessary; and the pharmacodynamic interactions among the treatments for these conditions can alter the response to anesthetic agents in unpredictable ways. To our knowledge, no previous report has described the concurrence of all three autoimmune diseases in a pregnant woman undergoing an obstetric emergency, which renders this

case both a genuine rarity and a source of transferable lessons. The aim of this report is to describe the clinical presentation, the multidisciplinary decision-making process, and the anesthetic technique and contingency planning that permitted a safe emergency cesarean section in this patient, and to situate that experience within the contemporary literature so as to propose a structured, disease-aware framework for anesthetists confronted with comparable combinations of autoimmune disease in pregnancy.

2. Case Presentation

A 34-year-old multiparous woman was referred for emergency cesarean section at 30 weeks' gestation. She had a five-year history of three concurrent autoimmune diseases, namely myasthenia gravis, ankylosing spondylitis, and multiple sclerosis, each established through recognized diagnostic criteria. The diagnosis of myasthenia gravis had been confirmed by detection of antibodies against the acetylcholine receptor together with characteristic electromyographic findings; ankylosing spondylitis was supported by a positive human leukocyte antigen B27 test in the context of inflammatory axial disease; and multiple sclerosis had been diagnosed on the basis of the clinical picture supported by autoimmune serology. Table 1 presents the demographic and baseline clinical characteristics of the patient. She was classified as a high-risk parturient and had received structured antenatal care at every trimester, with a multidisciplinary preoperative evaluation involving maternal-fetal obstetrics, neurology, internal medicine, and anesthesiology.

Table 1. Demographic and baseline clinical characteristics of the patient.

Parameter	Finding	Remark
Demographic and obstetric profile		
Age	34 years	Reproductive age; MG female-predominant
Parity	Multiparous	Previous pregnancies
Gestational age	30 weeks	Preterm; threatened preterm birth
Presenting event	PROM ~8 h prior	Prolonged rupture of membranes
ASA / risk status	High-risk parturient	Triple autoimmune disease
Autoimmune disease profile (5-year history)		
Myasthenia gravis	Anti-AChR antibody positive; EMG positive	Neuromuscular junction disorder
Ankylosing spondylitis	HLA-B27 positive; axial inflammatory disease	Axial-skeletal / airway implications
Multiple sclerosis	Clinical + autoimmune serology	CNS demyelination
Vital signs at presentation		
Blood pressure	128/76 mmHg	Normotensive
Heart rate	88 beats/min	Normal
Respiratory rate	20 breaths/min	Normal at rest
Temperature	36 °C	Afebrile
Laboratory panel	Within normal limits	No anemia, sepsis, or coagulopathy

The patient's disease had been maintained on a stable regimen of immunomodulatory therapy that was adjusted in dose during pregnancy under specialist supervision. Her maintenance treatment consisted of pyridostigmine at a dose of 60 mg five times daily for control of myasthenic symptoms, methylprednisolone 8 mg twice daily as background immunosuppression, and adalimumab 40 mg every two weeks directed principally at the ankylosing spondylitis. Table 2 summarizes this chronic regimen together with the rationale for each agent and the considerations that governed its continuation through pregnancy. The persistence of bulbar and generalized symptoms despite this regimen underscored the fragility of her neuromuscular reserve as she approached delivery.

Table 2. Chronic maintenance immunotherapy and peripartum considerations.			
Agent	**Dose**	**Target disease**	**Peripartum consideration**
Pyridostigmine	60 mg five times daily	Myasthenia gravis	Continue; avoid interruption to prevent weakness; dose adjusted in pregnancy
Methylprednisolone	8 mg twice daily	All three (immunosuppression)	Continue; consider perioperative stress cover; monitor glycemia
Adalimumab	40 mg every 2 weeks	Ankylosing spondylitis	Continue in adjusted form; weigh infection risk with prolonged PROM

At presentation, the patient reported that her membranes had ruptured approximately eight hours earlier, and she described irregular uterine contractions and a subjective reduction in fetal movement. Superimposed upon these obstetric complaints was a constellation of neurological symptoms that reflected active disease across all three conditions: ptosis and diplopia; dyspnea; dysphagia, dysarthria, and dysphonia; and generalized limb weakness. The coexistence of ocular, bulbar, and respiratory symptoms was of particular concern, because bulbar and respiratory involvement in myasthenia gravis is the principal predictor of perioperative respiratory compromise and of the need to escalate care. The mapping of these presenting features to their underlying autoimmune substrate is detailed in Table 3, which illustrates how a single clinical presentation drew simultaneously on three distinct disease mechanisms.

Table 3. Presenting clinical features mapped to the underlying autoimmune disease.		
Clinical feature	**Principal disease attribution**	**Clinical significance**
Ptosis, diplopia	Myasthenia gravis (ocular)	Fatigable ocular weakness
Dysphagia, dysarthria, dysphonia	Myasthenia gravis (bulbar)	Bulbar involvement; aspiration and airway risk
Dyspnea	Myasthenia gravis / multiple sclerosis	Respiratory muscle involvement; escalation risk
Limb weakness	MG (fatigable) and MS (demyelinating)	Overlapping motor deficit; baseline for monitoring
Axial stiffness (background)	Ankylosing spondylitis	Neuraxial access and airway difficulty
PROM, contractions, reduced fetal movement	Obstetric	Indication for emergency delivery

On examination the patient was hemodynamically stable, with a blood pressure of 128/76 mmHg, a pulse rate of 88 beats per minute, a respiratory rate of 20 breaths per minute, and a temperature of 36 degrees Celsius, as recorded in Table 1. Laboratory investigations, including full blood count, renal and hepatic indices, and coagulation parameters, were within normal limits, providing reassurance that there was no superimposed sepsis, anemia, or coagulopathy that would independently contraindicate a neuraxial technique. The overall peripartum course, from presentation through stabilization, anesthesia, delivery, and postoperative disposition, is depicted in Figure 1.

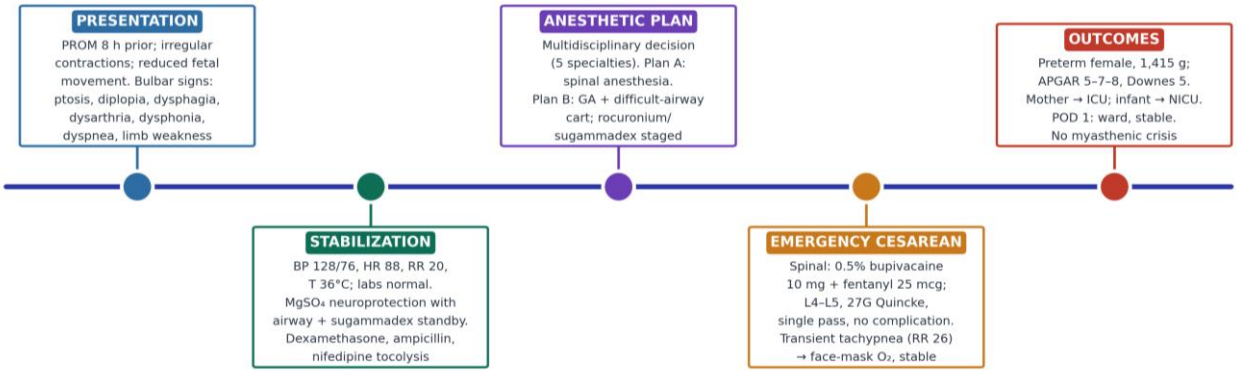

Figure 1. Peripartum clinical course of the patient, from presentation with premature rupture of membranes and active neurological symptoms, through pharmacological stabilization and multidisciplinary anesthetic planning, to spinal anesthesia for emergency cesarean section and the postoperative disposition of mother and infant. PROM, premature rupture of membranes; GA, general anesthesia; POD, postoperative day; ICU/NICU, (neonatal) intensive care unit.

During initial management the patient received supportive and pharmacological therapy directed at both the threatened preterm birth and the protection of the fetus. As detailed in Table 4, intravenous hydration was provided using a combination of Ringer's lactate, 5% dextrose, and normal saline in a ratio of 1:2:1. Fetal neuroprotection was undertaken with magnesium sulfate, administered as a 4-gram intravenous loading dose followed by an infusion of 1 gram per hour for 24 hours, a strategy consistent with the established neuroprotective role of antenatal magnesium before anticipated preterm birth.[12,13] Fetal lung maturation was promoted with dexamethasone 5 mg every 12 hours for 48 hours, prophylactic ampicillin 1 gram every 8 hours was given in view of the prolonged rupture of membranes, and nifedipine was used as a tocolytic at an initial dose of 20 mg followed by 10 mg three times daily. The decision to administer magnesium sulfate was taken with full awareness of its particular hazards in myasthenia gravis and was accompanied by heightened vigilance and immediate availability of airway and reversal equipment, a point developed further in the discussion. Table 4 details the peripartum pharmacotherapy and the anesthetic agents selected, together with the disease-specific rationale and cautions attached to each.

Table 4. Peripartum pharmacotherapy and anesthetic agents with disease-specific rationale and cautions.

Agent / intervention	Dose / detail	Rationale	Disease-specific caution
Obstetric and fetal-directed therapy			
Magnesium sulfate	4 g IV load, then 1 g/h x 24 h	Fetal neuroprotection at 30 weeks	Inhibits ACh release - may precipitate myasthenic crisis; airway + sugammadex at bedside
Dexamethasone	5 mg every 12 h x 48 h	Fetal lung maturation	Glycemic monitoring with background steroid
Ampicillin	1 g every 8 h	Prophylaxis for prolonged PROM	Monitor for drugs that may exacerbate MG
Nifedipine	20 mg then 10 mg three times daily	Tocolysis	Watch additive hypotension with neuraxial block
IV fluids	Ringer's lactate : D5 : NaCl = 1:2:1	Hydration / support	Avoid fluid overload
Anesthetic agents			
Bupivacaine 0.5%	2 mL (10 mg) intrathecal, L4-L5	Primary spinal anesthetic	Low dose limits LA mass (MS neurotoxicity concern)
Fentanyl	25 mcg intrathecal adjuvant	Improves block quality	Monitor respiratory reserve (MG/MS)
Rocuronium (standby)	Titrated, if GA required	Neuromuscular blockade for intubation	MG hypersensitivity; use reduced dose
Sugammadex (standby)	Reversal agent	Rapid, complete reversal of rocuronium	Bypasses acetylcholinesterase; safe in MG

After stabilization, and following simultaneous multidisciplinary consultation, the decision was taken to proceed to emergency cesarean section under spinal anesthesia. Spinal anesthesia was performed with the patient in the sitting position, with identification of the L4-L5 interspace, and 2 mL (10 mg) of 0.5% bupivacaine combined with 25 mcg of fentanyl as an adjuvant was administered through a 27-gauge Quincke-type spinal needle in a single, uncomplicated insertion without ultrasound guidance. The choice of a low-dose local anesthetic combined with a lipophilic opioid reflected an intention to secure dense surgical anesthesia while limiting the total mass of local anesthetic delivered, an approach consistent with contemporary practice for neuraxial anesthesia at cesarean delivery.[14,15] In anticipation of the possibility that the neuraxial technique might fail, given the recognized risk of technical difficulty in ankylosing spondylitis, a comprehensive contingency plan for conversion to general anesthesia was prepared in advance. A complete difficult-airway armamentarium, comprising a videolaryngoscope, a bougie, a fiberoptic scope, and supraglottic airway devices, was assembled and kept immediately accessible, and rocuronium and sugammadex were drawn up so that neuromuscular blockade, if it became unavoidable, could be titrated and then fully and rapidly reversed.[16,17]

Intraoperative monitoring showed that the patient's vital signs remained stable throughout the procedure, as detailed in Figure 2. As shown in Figure 2A, systolic blood pressure ranged from 138 mmHg at baseline to a nadir of 110 mmHg and returned to 115 mmHg by the end of the operation, diastolic pressure remained between 64 and 68 mmHg, and heart rate stayed steady between 69 and 76 beats per minute, so that no profound post-spinal hypotension developed. Oxygen saturation was preserved at 97 to 98 percent throughout, as illustrated in Figure 2B. The maintenance of maternal hemodynamic stability during spinal anesthesia for cesarean section, including the prevention and treatment of post-spinal hypotension with vasopressor strategies, is well characterized in contemporary randomized trials and pooled analyses, and the stable course observed here is consistent with that literature.[18,19] Also shown in Figure 2B, a single transient episode of increased respiratory rate, peaking at 26 breaths per minute, was observed without any accompanying feature of a high or total spinal block or other hemodynamic disturbance. Because the coexistence of myasthenia gravis and multiple sclerosis places the respiratory musculature at risk, supplemental oxygen was administered proactively through a face mask, and the patient responded promptly, with the respiratory rate settling back to approximately 20 breaths per minute and stability maintained until the conclusion of surgery.

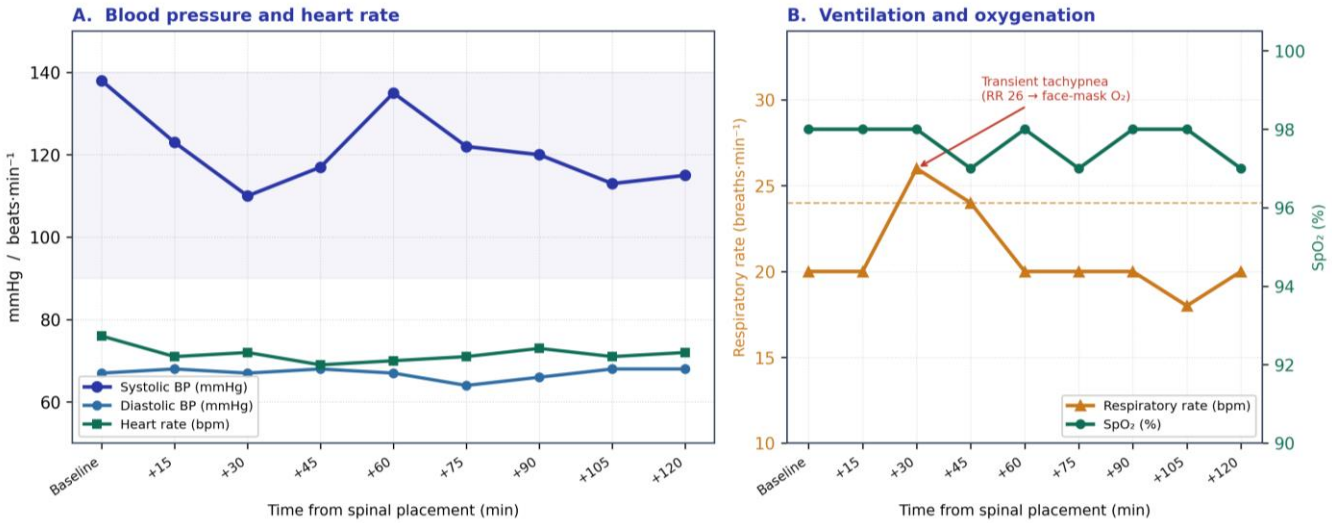

Figure 2. Serial intraoperative hemodynamic and respiratory trends during spinal anesthesia for cesarean section. (A) Systolic and diastolic blood pressure and heart rate remained stable without profound post-spinal hypotension. (B) A single transient rise in respiratory rate to 26 breaths per minute, without features of a high spinal block, resolved promptly with face-mask oxygen while oxygen saturation was preserved throughout.

A premature female infant was delivered with a very low birth weight of 1,415 grams and Apgar scores of 5, 7, and 8 at one, five, and ten minutes respectively. Initial neonatal assessment demonstrated mild-to-moderate respiratory distress, with a Downes score of 5, suggesting respiratory distress syndrome with a differential diagnosis of congenital pneumonia, and the infant was additionally considered to be at risk of early-onset neonatal sepsis in view of the prolonged rupture of membranes. Table 5 summarizes the neonatal outcome and the associated risk assessment. Postoperatively, the mother was admitted to the intensive care unit for close observation of respiratory function, hemodynamics, and neurological status, with specific attention to the possibility of a postpartum exacerbation of myasthenia gravis, while the infant was transferred to the neonatal intensive care unit for continued monitoring and support. The mother remained free of myasthenic crisis, was transferred to a general ward on the first postoperative day in a stable condition, and continued to be managed collaboratively by the obstetric, anesthetic, internal medicine, and neurology teams.

Table 5. Neonatal outcome and risk assessment.

Parameter	Finding	Interpretation
Gender	Female	-
Birth weight	**1,415 g**	Very low birth weight (prematurity)
Apgar score	**5 - 7 - 8 (1, 5, 10 min)**	Initial depression with recovery
Downes score	**5**	Mild-to-moderate respiratory distress
Working diagnosis	RDS; DDx congenital pneumonia	Respiratory support required
Additional risk	Early-onset neonatal sepsis	Prolonged PROM; close monitoring
Disposition	Neonatal intensive care unit	Intensive monitoring and support

3. Discussion

This case describes what is, to the best of our knowledge, the first reported instance of an emergency cesarean section in a parturient with three simultaneously active autoimmune diseases, namely myasthenia gravis, ankylosing spondylitis, and multiple sclerosis. The central lesson of the case is that these disorders do not simply add their individual risks together but interact to produce a synergistic hazard that must be addressed by an anesthetic strategy explicitly designed around their intersection. The successful conduct of spinal anesthesia in this setting, achieved despite the axial anatomical constraints of ankylosing spondylitis and the neuromuscular and demyelinating vulnerabilities of myasthenia gravis and multiple sclerosis, illustrates both the feasibility of neuraxial anesthesia in the most complex obstetric patients and the indispensable role of structured, multidisciplinary preparation in making that feasibility a reality.

The decision-making in this case rested upon the simultaneous collaboration of five specialties, comprising obstetrics, neurology, internal medicine, anesthesiology, and neonatology, each contributing a distinct perspective to a shared plan. This model of care accords with the recommendation, embodied in contemporary obstetric anesthesia practice, that optimal maternal and fetal outcomes in complex neuromuscular and neuro-inflammatory disorders are best achieved through structured, specialist-led pathways rather than through the sequential and fragmented involvement of individual clinicians.[4] In the present case the obstetric team defined the urgency and mode of delivery; the neurology team characterized the current activity of the myasthenia gravis and multiple sclerosis and the associated risk of exacerbation; the internal medicine team evaluated systemic status and the ongoing immunomodulatory regimen; the anesthetic team designed the technique together with its contingency plan; and the neonatal team prepared for the reception of a premature infant exposed both to maternal autoimmune disease and to perioperative medication. Figure 3 sets out the structured, branching algorithm that emerged from this collaboration and that guided the anesthetic conduct from preoperative assessment through to postoperative monitoring.

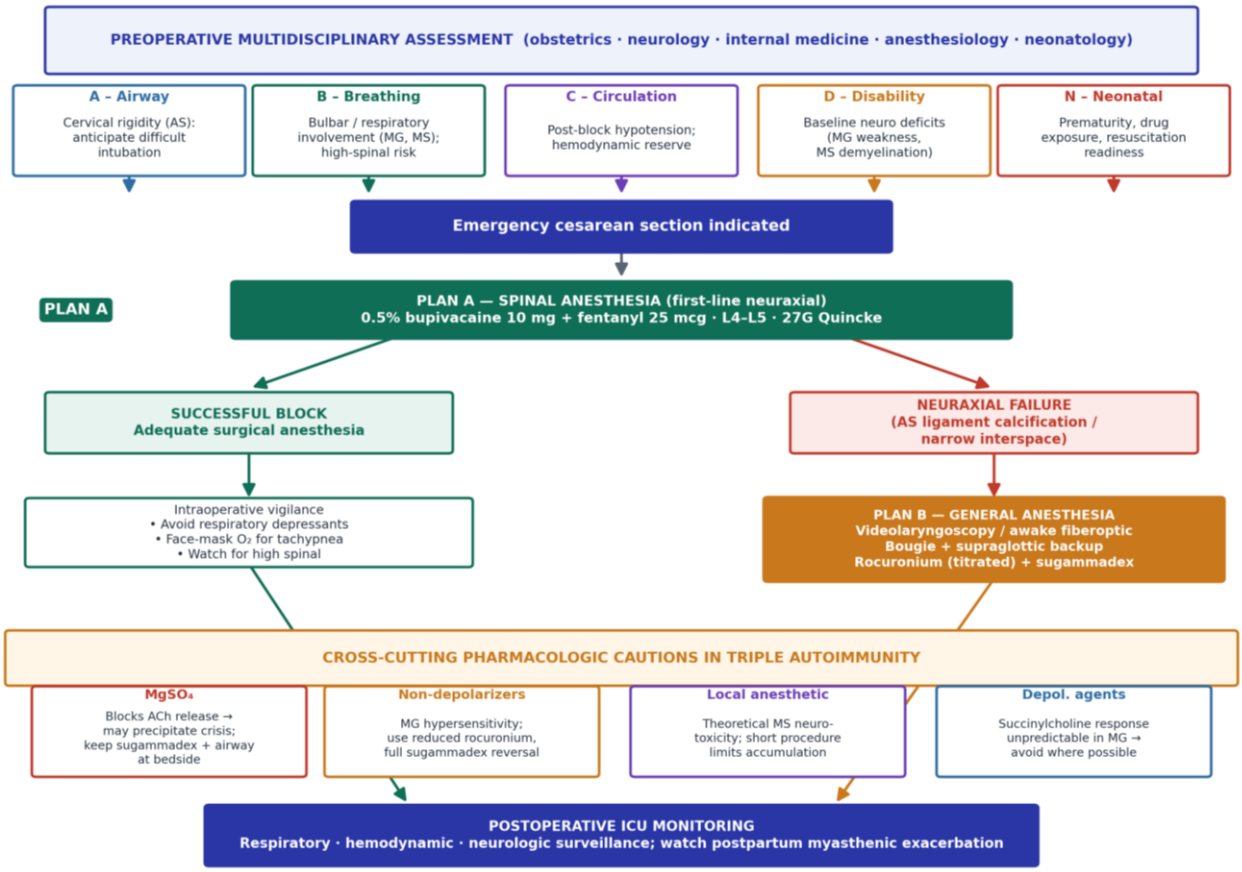

Figure 3. Structured anesthetic decision-making algorithm for the triple-autoimmune parturient, organized around a domain-based preoperative assessment (airway, breathing, circulation, disability, neonatal), a primary spinal anesthetic (Plan A) with a staged general-anesthesia airway-rescue plan (Plan B), and cross-cutting pharmacological cautions specific to the combination of myasthenia gravis, ankylosing spondylitis, and multiple sclerosis. AS, ankylosing spondylitis; MG, myasthenia gravis; MS, multiple sclerosis; ACh, acetylcholine; ICU, intensive care unit.

A structured preoperative framework for the multi-autoimmune parturient

A systematic preoperative assessment is the foundation of safe anesthesia in any complex patient, and in the multi-autoimmune parturient it is helpful to organize that assessment around a small number of explicitly labelled domains. The framework applied here can be summarized as an airway, breathing, circulation, disability, and neonatal sequence. The airway assessment centers on anticipating difficult intubation arising from the restricted cervical mobility of ankylosing spondylitis, which is the single most important determinant of whether conversion to general anesthesia can be accomplished safely.[8,20] The breathing assessment evaluates respiratory reserve and the degree of bulbar and respiratory muscle involvement in myasthenia gravis and multiple sclerosis, as well as the risk of a high or total spinal block that could compromise ventilation. The circulation assessment addresses baseline hemodynamic stability and the propensity to hypotension after neuraxial blockade. The disability assessment maps pre-existing neurological deficits, distinguishing the fatigable weakness of myasthenia gravis from the fixed or relapsing deficits of multiple sclerosis, so that any postoperative change can be interpreted against a documented baseline. Finally, the neonatal assessment anticipates the effects of prematurity and of perioperative drug exposure on the fetus and newborn. A thorough evaluation across these five domains provides the evidentiary basis for the central decision of whether, and how, to proceed with a neuraxial technique.

The value of formalizing this framework lies in its capacity to force explicit consideration of each disease at each step, rather than allowing the most salient condition to dominate planning at the expense of the

others. In a patient with myasthenia gravis alone, the anesthetist's attention naturally gravitates towards neuromuscular blockade and respiratory reserve; in a patient with ankylosing spondylitis alone, towards the airway and the technical feasibility of neuraxial access; and in a patient with multiple sclerosis alone, towards the theoretical neurotoxicity of local anesthetics and the risk of postpartum relapse. When all three diseases are present, none of these concerns can be allowed to eclipse the others, and a domain-based checklist ensures that each is weighed before a final plan is adopted. This disciplined breadth of consideration is precisely what distinguishes the management of the multi-autoimmune patient from that of the patient with a single disease.

Neuraxial anesthesia as the preferred technique and its disease-specific tensions

For a patient with myasthenia gravis undergoing cesarean section, neuraxial anesthesia is widely preferred over general anesthesia, principally because it avoids the neuromuscular blocking agents whose effects are so unpredictable in myasthenic muscle and whose residual action is a recognized cause of postoperative respiratory failure.[4] The same preference for a regional technique is supported in myasthenia gravis pregnancy by the wider obstetric anesthesia literature, which emphasizes the avoidance of respiratory depressants and the maintenance of spontaneous ventilation wherever possible.[4] In multiple sclerosis, the historical reluctance to use neuraxial techniques has been substantially revised by accumulating evidence. A recent systematic review of neuraxial anesthesia in patients with multiple sclerosis, drawing on more than two thousand patients across dozens of studies and predominantly in obstetric settings, concluded that neuraxial anesthesia can be administered safely, with a low incidence of severe complications and no consistent causal association between the anesthetic technique and postpartum relapse.[10] The relatively brief duration of a cesarean section, and the consequently limited accumulation of local anesthetic within the cerebrospinal fluid, further mitigate the theoretical concern about neurotoxicity in demyelinated tissue.[11]

It is ankylosing spondylitis that introduces the greatest technical tension into this otherwise coherent preference for a neuraxial approach. Calcification of the spinal ligaments and narrowing of the intervertebral spaces can render the midline approach to the subarachnoid space extremely difficult or impossible, and repeated attempts risk trauma, failure, and delay in an emergency setting. In the present case, however, spinal anesthesia was achieved at the L4-L5 interspace in a single pass, a fortunate outcome that cannot be relied upon in every patient with ankylosing spondylitis and that underscores the importance of preparing for failure in advance. Where the midline is inaccessible, a paramedian approach, careful selection of the lowest palpable interspace, and, where available, ultrasound guidance to identify a workable acoustic window are all reasonable adjuncts, although in this case the block was accomplished without ultrasound. The essential point is that the anesthetist must approach the neuraxial technique in such a patient with both optimism and a fully rehearsed alternative, so that a failed or impossible block prompts an immediate, controlled transition to the airway plan rather than a hurried improvisation.

The airway imperative and the contingency plan for general anesthesia

If neuraxial anesthesia cannot be achieved, conversion to general anesthesia becomes necessary, and it is here that ankylosing spondylitis exacts its heaviest toll. Restricted cervical mobility and, in advanced disease, fixed flexion deformity of the neck can make direct laryngoscopy and tracheal intubation exceptionally difficult, and this difficulty must be anticipated rather than discovered at the moment of crisis.[8,20] The contingency plan adopted in this case reflected these realities. Awake fiberoptic intubation is regarded as the gold standard for the anticipated difficult airway in ankylosing spondylitis, because it permits the airway to be secured while spontaneous ventilation and airway reflexes are preserved. Where time does not permit an awake fiberoptic approach, videolaryngoscopy offers a valuable alternative, because it improves glottic visualization without requiring the alignment of the oral, pharyngeal, and laryngeal axes that rigid direct laryngoscopy demands, and it can therefore enable intubation in a patient whose neck cannot be extended. The assembled armamentarium of videolaryngoscope, bougie, fiberoptic scope, and supraglottic airway device provided a graded set of options, and the immediate

availability of rocuronium with sugammadex ensured that, if muscle relaxation were required, it could be given in a titratable form and then reversed rapidly and completely.

The pairing of rocuronium with sugammadex deserves particular emphasis in the myasthenic patient. Patients with myasthenia gravis are markedly sensitive to non-depolarizing neuromuscular blocking agents, so that a standard intubating dose may produce profound and prolonged paralysis; a case of extreme and unexpectedly prolonged paralysis after rocuronium in a myasthenic patient illustrates this danger vividly.[17] The advent of sugammadex, which encapsulates rocuronium and reverses its effect independently of acetylcholinesterase activity, has transformed the safety profile of neuromuscular blockade in this population, and reports of its use for thymectomy and other procedures in myasthenia gravis document rapid and reliable reversal with a favorable complication profile.[16,17] The strategy of choosing rocuronium precisely because it can be fully reversed with sugammadex, rather than avoiding neuromuscular blockade altogether at the cost of a less controllable airway, represents a rational accommodation to the competing demands of a difficult airway and a vulnerable neuromuscular junction. In this case the neuromuscular blocking agents were prepared but never required, because the spinal anesthetic succeeded; their mere availability, however, was an essential component of the safety architecture that made it possible to proceed with confidence.

Magnesium sulfate: a necessary hazard in the myasthenic parturient

One of the most instructive tensions in this case concerns the use of magnesium sulfate. Antenatal magnesium sulfate has a well-established role in fetal neuroprotection before anticipated preterm birth, reducing the risk of cerebral palsy and gross motor dysfunction in surviving infants, and its administration in this patient at 30 weeks' gestation was entirely consistent with that evidence.[12,13] Yet magnesium is also one of the most dangerous drugs that can be given to a patient with myasthenia gravis. Magnesium ions act at the presynaptic terminal of the neuromuscular junction to inhibit the release of acetylcholine, competing with calcium at the site of vesicle fusion; in a patient whose postsynaptic acetylcholine receptors are already depleted by autoantibody-mediated destruction, this presynaptic reduction in transmitter release can precipitate a catastrophic worsening of weakness and, in the worst case, respiratory failure.[21] Reports of magnesium-induced respiratory compromise and of magnesium-related neuromuscular effects such as ophthalmoplegia in the peripartum period underscore that this is not a theoretical concern but a documented clinical danger.[21]

The management of this patient therefore required a careful reconciliation of two legitimate but opposing imperatives: the fetal benefit of magnesium neuroprotection and the maternal hazard of magnesium in myasthenia gravis. The reconciliation adopted here was neither to withhold magnesium reflexively nor to administer it complacently, but to give it under conditions of heightened vigilance, with intubation equipment, ventilatory support, and sugammadex immediately available at the bedside, so that any deterioration in neuromuscular function could be met without delay. Where the balance of risk tilts further against magnesium, alternative agents such as barbiturates or phenytoin may be considered for seizure prophylaxis, and the neuroprotective indication in particular must be weighed against the specific maternal risk. The general principle illustrated by this case is that a drug contraindicated in one of a patient's diseases may nonetheless be indicated for another purpose, and that the resolution of such conflicts lies not in rigid rules but in individualized risk assessment coupled with the preparation of rescue measures. The staged pharmacological cautions applicable to this patient, spanning magnesium, non-depolarizing and depolarizing neuromuscular blocking agents, and local anesthetics, are represented in the algorithm shown in Figure 3.

It is worth dwelling on why magnesium poses so specific a threat in this particular patient, because the mechanism clarifies the logic of the precautions taken. The safety margin of neuromuscular transmission depends on the release of a quantity of acetylcholine that comfortably exceeds the threshold required to generate a muscle action potential. In health, this margin is large,

and modest reductions in transmitter release are of no consequence. In myasthenia gravis, however, the autoantibody-mediated loss of postsynaptic receptors erodes that margin, so that the same synapse that was previously robust becomes critically dependent on maximal presynaptic output. Magnesium, by impeding the calcium-dependent release of acetylcholine, attacks the one remaining compensatory mechanism, and it does so at doses that are entirely therapeutic for tocolysis or neuroprotection. The result is that a drug with a wide safety margin in the general obstetric population has almost no safety margin in the myasthenic parturient, which is precisely why its administration in this case was tied to the immediate availability of ventilatory support. This example also illustrates a more general truth about the multi-autoimmune patient, namely that the interaction between a disease and a drug can convert a routine intervention into a high-risk one, and that the anesthetist must reason from mechanism rather than from population-level safety data when planning care.

Pharmacodynamic interactions and the selection of anesthetic agents

The selection of anesthetic and adjunctive agents in this patient was governed throughout by the recognition that each of the three diseases imposes its own pharmacological constraints, and that these constraints occasionally conflict. Depolarizing muscle relaxants such as succinylcholine produce unpredictable effects in myasthenia gravis, with some muscles displaying resistance and others heightened sensitivity, and are therefore generally avoided where an alternative exists. Non-depolarizing agents must be used, if at all, in markedly reduced doses and with full reversal capability, as already discussed. Local anesthetics raise a theoretical concern in multiple sclerosis, although the weight of evidence supports their safe use in the doses and durations typical of a cesarean section.[10] The corticosteroid component of the patient's chronic regimen, while directed at her autoimmune disease, also carries implications for perioperative glycemic control and for the stress response to surgery. The composite picture is one in which no single agent can be selected without reference to all three diseases, and in which the safest choices are frequently those that preserve the greatest degree of reversibility and physiological control.

This reasoning also extends to the management of the patient's background immunotherapy through the peripartum period. Pyridostigmine, methylprednisolone, and adalimumab each require thoughtful handling around delivery, with attention to the continuity of anticholinesterase therapy to avoid precipitating weakness, to the possible need for perioperative corticosteroid supplementation, and to the timing of biologic therapy in relation to infection risk in the setting of prolonged rupture of membranes. The broader literature on medication exposure in myasthenia gravis emphasizes that a wide range of commonly used drugs can exacerbate the disease, and that vigilance regarding drug selection extends well beyond the anesthetic agents themselves to encompass antibiotics, cardiovascular drugs, and magnesium.[21] In a patient receiving prophylactic ampicillin for ruptured membranes and magnesium for neuroprotection, this awareness is not academic but directly shapes the choice and monitoring of every drug administered.

The intraoperative course of this patient also merits reflection, because the single transient rise in respiratory rate to 26 breaths per minute, although clinically minor and readily corrected, is exactly the kind of event that demands a different interpretation in the multi-autoimmune patient than it would in an otherwise healthy parturient. In a patient without neuromuscular or demyelinating disease, a brief episode of tachypnea during cesarean section would ordinarily be attributed to anxiety, the sensory experience of surgery, or the transient effects of the block, and would prompt little more than reassurance. In this patient, however, the same sign had to be considered against the background possibilities of an ascending or high spinal block encroaching upon the respiratory musculature, of incipient respiratory fatigue from myasthenic or demyelinating weakness, and of the respiratory-depressant potential of the concurrent magnesium infusion. The appropriate response was therefore not to dismiss the sign but to interpret it seriously, to exclude a high block by clinical assessment, and to intervene early with supplemental oxygen while remaining prepared to escalate. The prompt resolution confirmed a

benign cause, but the episode illustrates how the differential diagnosis of even a trivial intraoperative event is broadened and its stakes raised in the patient with overlapping autoimmune disease, and how vigilance calibrated to that broadened differential is itself a form of treatment.

Disease activity, obstetric outcome, and the neonate

The obstetric and neonatal outcome of this pregnancy reflects both the severity of the maternal disease and the constraints it imposed on the timing of delivery. Maternal myasthenia gravis is associated in large cohort studies with increased rates of preterm birth and with a range of adverse obstetric and neonatal outcomes, and the delivery of a preterm infant at 30 weeks in this case is consistent with that recognized association.[3,4] A further consideration specific to myasthenia gravis is the transplacental transfer of maternal acetylcholine-receptor antibodies, which can affect the fetus and newborn and gives rise to the emerging spectrum of fetal acetylcholine-receptor antibody-related disorders, so that neonatal surveillance in the infant of a mother with myasthenia gravis must extend beyond the consequences of prematurity alone.[22] The very low birth weight of 1,415 grams, the Apgar scores of 5, 7, and 8, and the early respiratory distress with a differential diagnosis of respiratory distress syndrome and congenital pneumonia together define a neonate requiring intensive support, and the prolonged rupture of membranes added the further risk of early-onset sepsis. The proactive transfer of the infant to the neonatal intensive care unit and the anticipatory involvement of the neonatal team were therefore essential elements of the overall plan rather than afterthoughts, and they exemplify the principle that anesthetic planning in the complex parturient must always extend to the fetus and newborn.

For the mother, the postpartum period carries its own specific danger, because the hormonal and physiological upheaval of the puerperium, compounded by the stress of surgery, can precipitate a myasthenic exacerbation or crisis. Congenital and acquired myasthenic disorders alike demand heightened surveillance in the days after delivery, and reports of peripartum management in related neuromuscular conditions emphasize the value of a planned period of intensive monitoring.[3] The admission of this patient to the intensive care unit for observation of respiratory, hemodynamic, and neurological status, and the specific attention paid to the possibility of postpartum myasthenic deterioration, were therefore appropriate and precautionary. That she remained free of crisis and was well enough to transfer to the ward on the first postoperative day is a favorable outcome, but one that was secured by anticipation rather than left to chance.

Long-term disease-modifying therapy and the wider context of care

Although the acute anesthetic management is the focus of this report, the case cannot be fully understood without reference to the long-term treatment of the three underlying diseases, because chronic therapy shapes the baseline from which the acute event unfolds. In multiple sclerosis, the modern era of disease-modifying therapy has transformed prognosis, and contemporary guidelines and treatment algorithms provide detailed guidance on the selection, sequencing, and, increasingly, the de-escalation of these agents, including specific consideration of their use around pregnancy.[23,24] The management of disease-modifying therapy in pregnant and postpartum women, and the associated risk of relapse, is an area of active investigation, with recent large studies clarifying how therapeutic decisions during pregnancy influence the risk of relapse and how anti-CD20 agents such as ocrelizumab perform in this setting.[11,25] The question of when and how to discontinue or de-escalate disease-modifying therapy is likewise the subject of recent consensus work, reflecting a broader move towards individualized, life-course management of multiple sclerosis.[26]

The treatment of ankylosing spondylitis has similarly evolved, with biologic agents targeting tumor necrosis factor and the interleukin-17 pathway now central to controlling axial inflammation and, potentially, modifying the trajectory of structural damage.[5] The patient's maintenance adalimumab reflected this modern approach, and its continuation, in adjusted form, through pregnancy was part of a coherent strategy to keep all three diseases as quiescent as possible during gestation. The essential message is that the safety of the acute anesthetic event rests upon a foundation of well-controlled chronic disease, and that the anesthetist who

encounters such a patient in an emergency is, in effect, the beneficiary of months or years of careful outpatient management by multiple specialties. Recognizing this continuity encourages the anesthetist to communicate with the physicians responsible for long-term care, both to understand the patient's baseline and to ensure that the perturbations of the peripartum period do not destabilize a hard-won equilibrium.

Comparison with the existing literature and the novelty of this case

Placing this case within the published literature clarifies both what is familiar and what is genuinely new about it. The individual management of each disease in pregnancy has been described before: there are established protocols for labor and delivery in myasthenia gravis, reports and reviews of pregnancy complicated by ankylosing spondylitis with its attendant anesthetic challenges, and a substantial body of evidence supporting the safety of neuraxial anesthesia in multiple sclerosis.[4,8,10] Table 6 compares the present case with representative reports of single-disease and related presentations, highlighting the anesthetic technique employed and the outcome achieved in each. What distinguishes the present case from all of these is the simultaneous presence of three active autoimmune diseases in a single pregnant patient facing an obstetric emergency, a combination that, to our knowledge, has not previously been reported and that compounds the individual challenges into a single, indivisible clinical problem.

Table 6. Comparison of the present case with representative reports of autoimmune disease in pregnancy / peripartum anesthesia.

Feature	Present case	Single-disease reports in the literature
Autoimmune diseases	MG + AS + MS (triple, concurrent)	Typically one disease per report
Setting	Emergency cesarean, 30 weeks	Elective or emergency, variable gestation
Primary technique	Single-shot spinal (bupivacaine + fentanyl)	Neuraxial preferred in MG and MS; variable in AS
Key technical hurdle	AS axial rigidity threatens block AND airway	Isolated to airway (AS) or NMBA (MG)
Magnesium dilemma	Fetal indication vs MG contraindication	Rarely coincident
Airway contingency	Videolaryngoscope, fiberoptic, SGA; roc/sugammadex	Emphasized in AS airway reports
Outcome	Mother stable, no crisis; preterm VLBW infant to NICU	Generally favorable with planning

The novelty of the case is therefore not merely arithmetic. It is not that three separately manageable problems happened to coincide, but that their coincidence created interactions that neither the myasthenia literature, nor the ankylosing spondylitis literature, nor the multiple sclerosis literature addresses on its own. The most striking of these interactions is the collision between the fetal indication for magnesium and its maternal contraindication in myasthenia gravis; another is the way in which the axial rigidity of ankylosing spondylitis simultaneously threatens the neuraxial plan and the airway rescue plan, so that a single anatomical feature undermines both the primary technique and its principal alternative. A management framework that treats these diseases in isolation would fail to anticipate such interactions, whereas the integrated, domain-based approach described here brings them into view and allows them to be planned for. In this sense the case contributes a transferable conceptual model, and not merely a report of an unusual coincidence.

Learning points and limitations

Several practical lessons emerge from this experience. First, neuraxial anesthesia, and spinal anesthesia in particular, can be conducted safely even in a parturient burdened by three interacting autoimmune diseases, provided that it is undertaken with meticulous preparation and an experienced team. Second, the anesthetist must always prepare for the failure of the primary technique, and in a patient with ankylosing spondylitis that preparation must extend to a fully rehearsed difficult-airway plan, because the same disease that complicates neuraxial access also

complicates its principal alternative. Third, drugs that are indicated for one of a patient's conditions may be hazardous for another, and the resolution of such conflicts lies in individualized risk assessment together with the ready availability of rescue measures, as exemplified by the administration of magnesium under the protection of immediate airway and reversal capability. Fourth, the postpartum period is a time of specific danger in myasthenia gravis and warrants planned intensive monitoring. Finally, the outcome in such cases depends less on any single heroic intervention than on the disciplined, structured collaboration of multiple specialties, both in the acute event and in the long-term management that precedes it.

This report has limitations inherent to the description of a single patient. As a case report it can establish feasibility and generate hypotheses, but it cannot demonstrate that the chosen approach is superior to alternatives, nor can it quantify the risk of any particular strategy. The favorable outcome achieved here should not be interpreted as a guarantee that spinal anesthesia will always succeed in patients with ankylosing spondylitis, nor that magnesium can always be given safely in myasthenia gravis; both decisions were made in the context of this patient's specific disease severity and anatomy, and both were supported by contingency measures that were fortunately not required. The absence of long-term follow-up data on the mother's neurological trajectory and on the infant's development is a further limitation. Nonetheless, the structured framework described here, organized around explicit clinical domains and a staged contingency plan, offers a rational and transferable approach that can be adapted to the individual circumstances of comparable patients, and it is offered in that spirit rather than as a fixed prescription.

4. Conclusion

Pregnancy complicated by three coexisting autoimmune diseases, in this case myasthenia gravis, ankylosing spondylitis, and multiple sclerosis, presents a profound and multidimensional challenge to both the obstetric and the anesthetic team. The essential insight of this report is that such diseases interact synergistically rather than additively, so that the safe conduct of an emergency cesarean section depends upon an anesthetic strategy explicitly designed around their intersection. In this patient, carefully performed spinal anesthesia, achieved despite the axial constraints of ankylosing spondylitis and the neuromuscular and demyelinating vulnerabilities of myasthenia gravis and multiple sclerosis, delivered adequate surgical conditions while preserving spontaneous ventilation and avoiding the hazards of neuromuscular blockade. This success rested upon a foundation of simultaneous multidisciplinary planning, disease-aware selection of every drug administered, a structured domain-based preoperative assessment, and a fully prepared, staged contingency plan for airway rescue that included titratable neuromuscular blockade with immediate sugammadex reversal. Regional anesthesia is not automatically safer or technically easier in the setting of overlapping autoimmune disease, and its apparent simplicity in this case should not obscure the elaborate preparation that made it possible. Comprehensive, anticipatory, and collaborative management, extending from the antenatal period through the acute event to the vigilant postpartum monitoring that guards against myasthenic crisis, is what ultimately safeguards the lives of both mother and infant, and it is this integrated approach, rather than any single technique, that this report commends to clinicians confronting comparable emergencies.

Declarations

Ethics approval and consent to publish

Written informed consent was obtained from the patient for the publication of this case report, including all accompanying clinical details, tables, and figures. A copy of the written consent is available for review upon request. The management described was undertaken as part of routine clinical care and in accordance with the ethical principles of the 1964 Declaration of Helsinki and its later amendments.

Competing interests

The authors declare that they have no competing interests.

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Author contributions

All authors contributed to the clinical management of the patient and to the conception of this report. RTH Supraptomo and Andy Nugroho supervised the anesthetic management and critically revised the manuscript for important intellectual content. Putri Junita Sari performed the literature review and drafted the manuscript. All authors have reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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