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A Multidisciplinary Approach to Managing Pregnancy-Associated Spinal Schwannoma: Case Report of Neurological and Obstetric Challenges with Surgical Management

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Running Title Managing Pregnancy-Associated Spinal Schwannoma

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ABSTRACT

Spinal schwannomas are rare during pregnancy and pose unique diagnostic and therapeutic challenges, as their symptoms may mimic common gestational complaints. We report the case of a 28-year-old woman, gravida 3 para 2, who presented at 33 weeks + 1 day of gestation with progressive left lower limb weakness.

Magnetic resonance imaging (MRI) performed at 33+5 weeks revealed an extradural tumor at the D9 vertebral level, causing significant spinal cord compression. A multidisciplinary team—including obstetrics, neurosurgery, anesthesiology, and neonatology—developed a sequential management strategy.

At 34 weeks gestation, the patient experienced spontaneous preterm premature rupture of membranes. Labor was induced using a Foley catheter, and she delivered a healthy female infant weighing 2.15 kg, with Apgar scores of 7 and 8 at one and five minutes, respectively.

At 34+4 weeks, she underwent D9 laminectomy and complete tumor excision under general anesthesia. Histopathological examination confirmed a benign schwannoma. Postoperatively, her neurological deficits improved markedly, and by day 11 she had regained near-normal strength in her lower limbs.

This case underscores the importance of early recognition of neurological deficits during pregnancy, the utility of MRI for timely diagnosis, and the critical role of multidisciplinary collaboration. Individualized planning and well-coordinated obstetric and neurosurgical interventions can lead to favorable outcomes for both mother and child in these rare but high-risk clinical situations.

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Introduction

Pregnancy is a physiological state marked by profound changes that can exacerbate pre-existing conditions or mask underlying pathologies. Spinal tumors during pregnancy are exceedingly rare, with a reported incidence of less than 0.2% of all pregnancies. These tumors can present significant diagnostic and therapeutic challenges due to their rarity, overlapping symptoms with common pregnancy-related conditions, and the need to balance maternal and fetal health. The symptoms of spinal tumors, such as pain, weakness, or paresthesia, are often dismissed as sciatica or pregnancy-induced discomfort. However, progressive neurological deficits or unrelenting pain warrant thorough evaluation, as early intervention can prevent irreversible damage. In pregnancy, the physiological increase in vascular and cerebrospinal fluid pressures, coupled with hormonal changes, may accelerate tumor growth or exacerbate symptoms. Magnetic Resonance Imaging (MRI) is the preferred diagnostic tool, as it provides detailed visualization without ionizing radiation [1,2]. However, the use of gadolinium-based contrast agents is typically avoided during pregnancy due to potential fetal risks. Advances in microsurgical techniques and intraoperative monitoring have improved surgical outcomes, allowing for safer tumor resection with minimal harm to the mother and fetus. Multidisciplinary management, involving obstetricians, neurologists, anesthesiologists, and neonatologists, is critical to address the complexities of these cases effectively [3].

This case report highlights a rare presentation of a spinal tumor in a pregnant woman at 33 weeks of gestation, manifesting as lower limb monoparesis. The diagnostic and therapeutic journey underscores the complexities of managing such cases and emphasizes the importance of individualized care plans. Through coordinated efforts, timely delivery and surgical intervention were achieved, resulting in favorable maternal and neonatal outcomes. This case contributes to the limited literature on pregnancy-associated spinal tumors, offering insights into clinical decision-making and management strategies.

Case Presentation

A 28-year-old woman, gravida 3 para 2 (G3P2L2), presented at 33 weeks + 1 day of gestation with progressive difficulty in walking and left lower limb weakness for five days. She was referred to our tertiary care center following worsening of symptoms. Her obstetric history included two previous normal vaginal deliveries, and she had no significant comorbidities. She denied fever, trauma, headache, visual disturbances, or abdominal pain. On examination, the patient was conscious, oriented, and afebrile, with stable vital signs.

- **Neurological Examination:** Muscle power was 5/5 in both upper limbs and the right lower limb, but reduced to 3/5 in the left lower limb. The plantar reflex on the left was extensor, consistent with upper motor neuron involvement. She was unable to ambulate independently.

- **Obstetric Examination:** The uterus corresponded to approximately 34 weeks of gestation. Fetal heart rate was regular and reassuring. Ultrasonography confirmed a cephalic presentation with an amniotic fluid index (AFI) of 10 cm and no detectable abnormalities.

MRI of the dorsal spine performed at 33+5 weeks of gestation revealed an intramedullary extradural tumor at the D9 vertebral level, producing significant spinal cord compression (Figure 1). The lesion was provisionally diagnosed as either a meningioma or a schwannoma. Doppler studies conducted at 33+2 weeks excluded deep vein thrombosis, while obstetric ultrasound on the same day confirmed cephalic presentation with normal AFI. The sequence of key clinical events is summarized in Table 1.

The neurological deficits were attributed to compressive myelopathy caused by the D9 tumor. A multidisciplinary team of obstetricians, neurologists, anesthesiologists, and neonatologists developed a management strategy that prioritized delivery before neurosurgery to minimize maternal and fetal risks.

- **Obstetric Management:** At 34+0 weeks, the patient experienced spontaneous preterm premature rupture of membranes (PPROM). Labor was induced using a Foley catheter, and at 34+1 weeks, she delivered a live female infant weighing 2.15 kg, with Apgar scores of 7 and 8 at one and five minutes, respectively. The delivery was uneventful, and the neonate required no resuscitation.

- **Neurosurgical Management:** At 34+4 weeks, the patient underwent a D9 laminectomy and complete tumor excision under general anesthesia. A prone positioning cushion was used to reduce compression on the inferior vena cava and gravid uterus. Intraoperative findings confirmed a benign schwannoma, and postoperative imaging verified

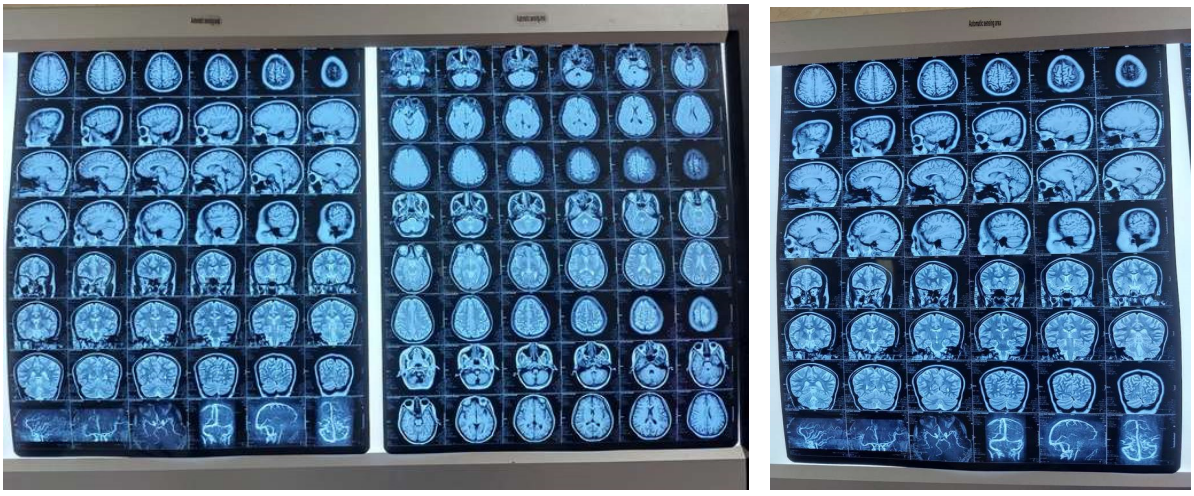

Fig. 1. Axial MRI at 33+5 weeks of gestation showing an extradural lesion at the D9 level compressing the spinal cord (highlighted area).

Table 1. Clinical course expressed in gestational age (weeks + days)/ postpartum interval.

Postpartum Interval	Event
Day -6 (33+1 weeks GA)	Patient admitted with progressive left leg weakness
Day -5 (33+2 weeks GA)	MRI brain and Doppler studies performed; DVT excluded
Day -2 (33+5 weeks GA)	MRI of the dorsal spine revealed extradural tumor at D9 with cord compression
Day -1 (34+0 weeks GA)	Labor induced with Foley catheter in view of spontaneous PPROM
Day 0 (Delivery)	Vaginal delivery of a healthy female infant
Day 3 postpartum	D9 laminectomy and complete tumor excision performed
Day 13 postpartum	Postoperative follow-up confirmed neurological recovery

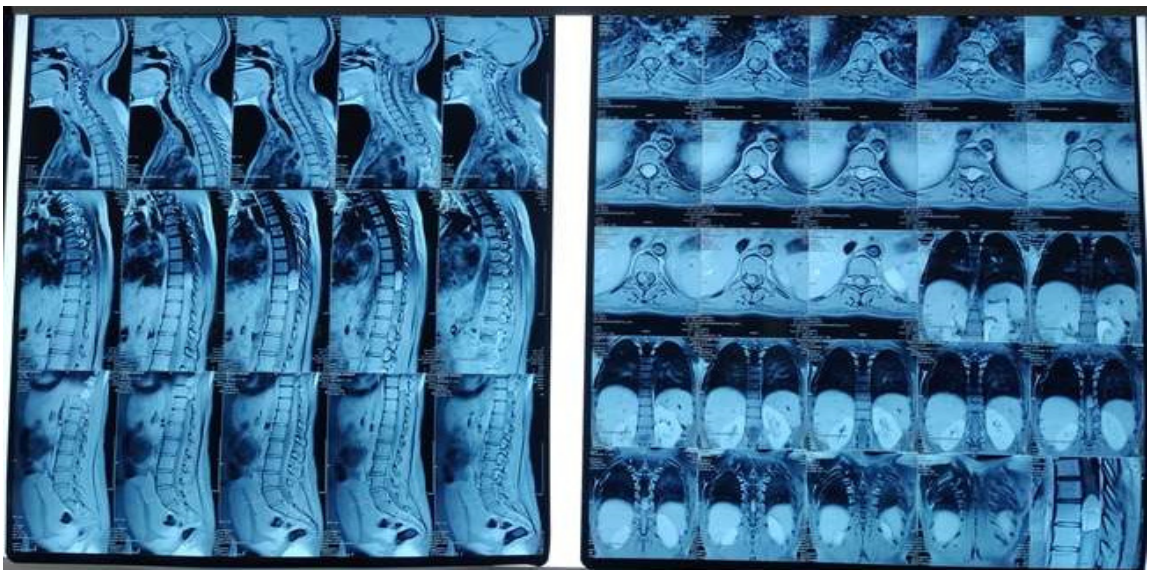

Fig. 2. Postoperative sagittal MRI at 34+4 weeks of gestation showing adequate decompression of the spinal cord following D9 laminectomy and complete tumor excision.

complete decompression of the spinal cord (Figure 2).

Obstetric and Neurological Outcomes Maternal and neonatal outcomes are summarized in Table 2.

The patient showed progressive neurological improvement. By postoperative day 11, she had regained near-normal lower limb strength and was able to ambulate with minimal assistance. Follow-up

Table 2. Obstetric and neurosurgical outcomes.

Parameter	Details
Neonate	Female, 2.15 kg; Apgar 7/10 and 8/10 at 1 and 5 minutes
Maternal Postoperative Recovery	Near-normal lower limb strength regained by postoperative day 11
Pathology Findings	Benign schwannoma

Postoperative Course

MRI confirmed complete decompression of the spinal cord, with no residual tumor. She was discharged in stable condition, with advice for physiotherapy and regular follow-up.

Discussion

Spinal schwannomas are benign nerve sheath tumors that account for a small proportion of spinal neoplasms, and their occurrence during pregnancy is exceptionally rare. The diagnostic process in such cases is often complicated by overlapping symptoms of pregnancy—such as backache, leg weakness, or gait disturbances—which are easily misattributed to physiological changes. In the present case, the patient presented with progressive lower limb weakness in the third trimester, and timely evaluation revealed a spinal extradural lesion compressing the cord. This underscores the importance of maintaining a high index of suspicion for neurological pathology in pregnant patients with persistent or worsening deficits [4].

Reports in the literature describe a limited number of pregnancy-associated spinal schwannomas, with most cases diagnosed in the second or third trimester. Kawaguchi et al. (2020) highlighted the potential role of hormonal changes—particularly elevated estrogen and progesterone—in accelerating tumor growth and symptom progression. Similarly, retrospective series have emphasized that spinal tumors in pregnancy tend to present late, often after significant neurological compromise. Our case adds to this body of evidence, illustrating that rapid neurological deterioration can occur even in the final weeks of gestation, necessitating urgent management.

In contrast to other reports where surgical excision was deferred until the postpartum period, our team opted for a sequential approach: induction of labor at 34 weeks, followed by neurosurgical resection shortly thereafter. This strategy balanced the risks of maternal neurological decline against the benefits of fetal maturity and led to favorable outcomes for both mother and neonate. To our knowledge, only a handful of similar cases combining obstetric and neurosurgical interventions in such close succession have been documented, making this case particularly valuable [5,6].

The decision to induce labor was influenced by two critical factors: the occurrence of preterm premature rupture of membranes (PPROM) and the need to expedite neurosurgical intervention. Immediate delivery reduced the risks associated with fetal prematurity while creating the opportunity for safe maternal surgery. The subsequent laminectomy and tumor excision were technically successful, and the patient experienced rapid neurological recovery. This sequence of interventions highlights how multidisciplinary planning can mitigate both maternal and fetal risks in rare, high-stakes clinical situations [7,8].

Several important lessons emerge from this case:

1. Early Recognition of Neurological Symptoms: Persistent or progressive weakness during pregnancy should not be dismissed as routine discomfort. Prompt imaging is essential for accurate diagnosis.

2. Role of MRI: Non-contrast MRI remains the safest and most informative diagnostic tool during pregnancy, allowing detailed assessment without fetal exposure to ionizing radiation.

3. Impact of Hormonal Changes: The potential for pregnancy-related hormonal fluctuations to accelerate tumor growth calls for heightened vigilance and closer monitoring of neurological symptoms.

4. Multidisciplinary Approach: Collaborative management by obstetricians, neurologists, anesthesiologists, and neonatologists was critical in achieving successful maternal and neonatal outcomes.

5. Timing of Intervention: Balancing fetal maturity against maternal neurological decline is central to decision-making. In our case, induction of labor followed by timely surgery resulted in optimal recovery for both mother and child.

Future Directions

Given the rarity of spinal schwannomas in pregnancy, evidence remains limited to case reports and small series. More systematic reporting of such cases

will help refine guidelines on the timing of delivery, perioperative management, and long-term maternal and neonatal outcomes.

Conclusion

This case illustrates the unique challenges of diagnosing and managing spinal schwannomas during pregnancy. Neurological deficits in pregnant patients should not be overlooked as routine discomforts, and MRI remains the most effective diagnostic tool in this context. Optimal outcomes were achieved through a carefully coordinated multidisciplinary strategy that prioritized both maternal neurological recovery and fetal safety. The successful sequence of timely delivery followed by definitive neurosurgical excision highlights the importance of individualized planning, early recognition, and collaborative care in managing rare spinal tumors during pregnancy.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this article.

Patient Consent

Written informed consent was obtained from the patient for the publication of this case report, including all accompanying images and clinical data.

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Conflict of Interests

The authors declare no conflicts of interest related to the publication of this case report.

List of Abbreviations

AFI: Amniotic Fluid Index

APGAR: Appearance, Pulse, Grimace, Activity, Respiration

CNS: Central Nervous System

DVT: Deep Vein Thrombosis

EF: Ejection Fraction

FHR: Fetal Heart Rate

GA: Gestational Age

GnRH: Gonadotropin-Releasing Hormone

IV: Intravenous

LMWH: Low-Molecular-Weight Heparin

MRI: Magnetic Resonance Imaging

NVD: Normal Vaginal Delivery

PPIs: Proton Pump Inhibitors

PPROM: Preterm Premature Rupture of Membranes

SOL: Space-Occupying Lesion

VTE: Venous Thromboembolism

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