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Case Report

Anesthetic Considerations for Cesarean Section in a Patient with Poland Syndrome: A Case Report and Literature Review

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Abstract

Background: Poland syndrome is a rare congenital anomaly involving unilateral pectoralis muscle hypoplasia, often accompanied by upper limbs and chest wall defects. The unilateral underdevelopment or absence of the pectoralis major muscle in this sporadic condition can pose a cosmetic, functional or psychological impact to affected patients. Anesthetic management in obstetric settings is challenging due to potential respiratory compromise and with even higher potential risks to patients with Poland syndrome. This report describes a successful anesthetic management using subarachnoid anesthesia for an elective cesarean section in a patient with Poland syndrome. Case Presentation: In this case report, a 37-year-old primigravida with Poland syndrome presented at 37 weeks gestation for elective cesarean section is the subject of interest. We describe how subarachnoid anesthesia was administered for better pain management, while avoiding general anesthesia to mitigate airway complications and potential malignant hyperthermia (MH) risks. Preoperatively a routine physical examination was conducted. There was noted the presence of signs of a mild Poland syndrome represented by mild chest wall asymmetry without respiratory compromise. The results for the blood work were within normal parameters with the exception of mild anemia and thrombocytopenia. All other laboratory results were within normal parameters. Intraoperatively, in addition to the cesarean delivery, a myomectomy was performed for a 2x2 cm anterior fibroid mass. The neonate (3065 g, Apgar 8/9) was examined as healthy. Postoperative recovery of the mother was uneventful with supportive therapy for mild anemia. Conclusions: Subarachnoid anesthesia in this case proved viable, safe and effective, avoiding potential risks with general anesthesia. Individualized care and management are a necessity for patients with Poland syndrome, specifically in obstetric patients.

Keywords: Poland syndrome; cesarean section; subarachnoid anesthesia; spinal anesthesia; obstetric anesthesia; uterine fibroids; regional anesthesia; postpartum care

1. Introduction

Poland syndrome is a rare congenital condition characterized by unilateral underdevelopment or absence of the pectoralis major muscle, often accompanied by upper-limb anomalies (short fingers, partial syndactyly and brachydactyly), rib deformities, possible ipsilateral breast hypoplasia or asymmetry (in females) and chest wall deformities (contour differences; scoliosis or rib anomalies).

From an epidemiological standpoint, Poland syndrome occurs more frequently on the right side of the chest than on the left and in approximately 1 in 20,000 to 30,000 live births (predominantly in males). The estimated male-to-female ratio is 2:1 to 3:1. [1]

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Though the exact etiology and pathogenesis are not fully understood, the leading etiological hypothesis involves *vascular disruption* during embryogenesis (hypoplasia/occlusion of subclavian or related vessels) causing reduced blood flow to the developing chest and limb bud around weeks 6–7 of gestation. Other proposed contributors to this syndrome include teratogens and rare familial/genetic cases. [4]

Diagnosis is primarily clinical, where the history and physical exam are valuable. Imaging: chest X-ray/CT or MRI to define chest wall and muscle anatomy; hand X-rays if limb anomalies are suspected. Mild cases of Poland syndrome like this case report exhibit no limb anomalies.

Evaluation and referral to genetics can be considered if there are additional anomalies or a family history. Although there is **no single cure,** management is individualized and often surgical for cosmetic/functional goals, i.e., chest wall reconstruction or breast augmentation. [1,10]

Poland syndrome patients during anesthetic management could face challenges due to potential thoracic deformities impairing ventilation, paradoxical breathing [2,6], and a theoretical reported association with malignant hyperthermia (MH).[7] Therefore, the purpose of the report is to add to the limited research on Poland syndrome patients, reviewing existing literature and exploring specifically, anesthetic considerations in relation with obstetric patients with Poland syndrome.

The importance of this report highlights how much more advanced research still required not only on Poland syndrome, anesthesia and obstetric patients independently, but rather synergistic research to discover new treatment possibilities and potentially overlooked side effects of current medication in these types of patients. The case report highlights the viability of neuraxial techniques as a preferred option in obstetric patients with Poland syndrome, though individualized care, possible risk of transfer of Poland syndrome to the newborn and the potential anesthetic risks in patients with Poland syndrome.

Clinical Significance: This case report presents a neuraxial anesthesia provide to Poland syndrome pregnant patient scheduled for cesarean section, emphasizing its practicality for minimizing respiratory and potential MH risks in a condition with limited anesthetic literature, particularly in pregnancy.

2. Case Presentation

A 37-year-old female Rh+ with known medical history of Poland syndrome was evaluated on June 5, 2025, for obstetric evaluation at 34 weeks of gestation. Pre-admission ECG showed normal sinus rhythm without ischemic changes. Vital signs on admission: blood pressure 120/80 mmHg, pulse 78 bpm, temperature 36.8°C. Physical exam revealed mild chest wall asymmetry consistent with Poland syndrome but no respiratory compromise and no other significant conditions reported. Abdominal exam confirmed pregnancy without noticeable abnormalities. Genitourinary, gastrointestinal, respiratory, neurological, endocrine, and sensory systems were within normal parameters.

2.1. Family Medical History

Normal with no reported chronic familial diseases including Poland syndrome. Patient reported no known allergies, no smoking or alcohol consumption as well as no medications. The patient is also reported to have no miscarriages / induced abortions in the past.

During the preanesthetic assessment the patient had a cardiology and respiratory check and no abnormalities were noticed. The meeting with the anesthetist aimed to prepare the patient for a regional neuraxial technique. This visit also included a full blood test panel, ECG and a clinical examination.

She presented to Obstetrics-Gynecology Clinic at Pelican Hospital, Oradea, Romania, on the 6th of August, 2025, the same medical unit where she was supervised for the last trimester of the pregnancy and an elective cesarean section was considered.

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2.2. Tables and Interpretations

Table 1. Timeline of Key Events.

Date	Event
June 5, 2025	Obstetric evaluation at 34 weeks; mild chest asymmetry noted
August 6, 2025	Admitted to the hospital for supervision
August 7, 2025	Elective cesarean section under subarachnoid anesthesia + myomectomy
August 10, 2025	Discharge in good general condition

From Table 2, we notice the preoperative lab results show mild thrombocytopenia and anemia, which was managed supportively.

Table 2. Preoperative Laboratory Results.

Parameter	Value	Reference Range
RBC	3.72 × 10^6/μL	4.0-5.2 × 10^6/μL
Hemoglobin	11.2 g/dL	12-16 g/dL
WBC	6.2 × 10^3/μL	4-11 × 10^3/μL
Platelets	117 × 10^3/μL	150-450 × 10^3/μL
Prothrombin time	11.9sec	9.8 – 12.1 sec
INR	1.02	0.8–1.2

The elective cesarean was performed on August 7, 2025, under subarachnoid anesthesia to avoid compromised breathing and malignant hyperthermia risks. A transverse Pfannenstiel incision was implemented, and an uneventful C-section delivery occurred. The delivery yielded a live healthy male neonate, with no immediate complications noted (3065g, Apgar score 8/9 at 1/5 minutes). Intraoperatively, uterine fibromatosis was confirmed, and a myomectomy removed a 2x2 cm anterior fibroid 5 cm from the fundus.

Postoperative Evolution was favorable, with stable vital signs. Pain was well-controlled, and the patient was afebrile with normal diuresis and bowel function. Prophylactic antibiotics, analgesics, and anticoagulant treatment were prescribed for the patient

Table 3. Post-operative Laboratory Results.

Parameter	Value	Reference Range
RBC	3.19 × 10^6/μL	4.0-5.2 × 10^6/μL
Hemoglobin	9.7 g/dL	12-16 g/dL
WBC	10.26× 10^3/μL	4-11 × 10^3/μL
Platelets	113 × 10^3/μL	150-450 × 10^3/μL

Microbiological vagina culture: Streptococcus beta hemolytic group B

Table 4. Treatment and Interventions.

Phase	Medication	Dose	Route	Indication
Intraoperative	Bupivacaine	12.5 mg	Subarachnoid	Anesthesia

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	Fentanyl	20 micrograms	Subarachnoid	Anesthesia
	Morphine	100 micrograms	Subarachnoid	Postoperative analgesia
	Dexamethasone	8 mg	IV	Anti-inflammatory/anti-emetic
	Carbetocin	100 micrograms	IV	Uterotonic (prevent atony)
	Ondansetron	8 mg	IV	Anti-emetic
	Cefuroxime	1,5 gr	IV	Antibiotic Prophylaxis
Hospitalization	Clexane	40 mg/0.4 mL OD	SC	Prophylactic anticoagulation
	Paracetamol	1 g QDS	IV/PO	Analgesia
	Ibuprofen	400 mg TDS	IV/PO	Analgesia/Anti-inflammatory
	IV iron	100 mg OD	IV	Iron supplementation (anemia)
	Metoclopramide Ondansetron	10 mg TDS 4-8 mg TDS	IV	Anti-emetic– PRN Anti-emetic– PRN
Post-Discharge	Clexane	0.4 mL OD for 10 days	SC	Prophylactic anticoagulation
	Ferrous Sulfate	325 mg OD for 30 days	PO	Iron supplementation (anemia)

2.3. Outcome

In the 3 days post delivery the case progression was favorable with vital signs within a normal range, good pain control, afebrile, good diuresis and normal bowel opening. The patient experienced breastfeeding difficulties due to hypogalactia. She was discharged on August 10, 2025, with good general status, stable vitals, uterus involution as expected, reduced serous-sanguinolent postpartum vaginal discharge, C-section incision and with normal healing progression. Also, the patient received recommendations for pain control, hygiene, lactation support, iron monitoring and follow-up at 5-7 days.

3. Discussion

3.1. Anesthesia Considerations in Poland syndrome

Anesthesia for Poland syndrome patients demands meticulous preoperative assessment for associated anomalies like cardiac defects, dextrocardia, or lung hypoplasia, which may affect ventilation and hemodynamics. [2].

It is important to note that the anesthetic procedures for these patients should be provided by an experienced senior doctor, in order to reduce the risk of a complication/failure during the anesthetic administration. Failure in administering neuraxial anesthesia in these patients would result in the unexpected administration of general anesthesia; this is associated with higher risks, including respiratory complications and the potential for malignant hyperthermia. The absence of pectoral muscles and potential chest wall deformities could cause paradoxical breathing, increased

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risk of hypoventilation and postoperative pulmonary complications. These potential complications would necessitate mechanical ventilation during general anesthesia [7].

This case demonstrates successful neuraxial anesthesia for C-section in a patient with PS, aligning with recommendations to prefer regional techniques when feasible to avoid Malignant Hyperthermia triggers such as volatile anesthetics**.** [3,6]

It was observed in this case there were no intraoperative or postoperative complications from the anesthesia and C-section procedure and this positive outcome can be attributed to several factors:

- This patient was given meticulous preoperative evaluation that ruled out significant cardiopulmonary anomalies, proper care and careful intraoperative monitoring of vital functions, temperature and mental state
- The patient's Poland syndrome manifested with relatively mild, non-severe musculoskeletal involvement and no functional thoracic or respiratory compromise, this considerably reduced pre- and post- operative risks/complications

3.2. Possible Risk of Transfer of Poland Syndrome to the Newborn

In our case, the patient reported no family history of Poland syndrome. This fact and data collected from literature suggest low risk of transmission to the newborn.

Poland syndrome is predominantly a sporadic condition with no known specific causative gene. The literature and research support this by showing the low inheritance risk and no direct link showcasing the passing down of the condition to offspring. [1].

Although there is no routine genetic testing available for Poland syndrome due to the absence of diagnostic molecular markers for the mother to determine the susceptibility of transfer, the diagnosis of Poland syndrome can be done prenatally. This is rarely done but it is possible (ultrasound as early as the **second trimester ~18–22 weeks,** can detect chest wall asymmetry, rib defects, or limb anomalies). Genetic counseling is recommended to further discuss and review familial history.

The syndrome however is recognized in most moderate-to-severe cases **immediately after birth** when chest wall asymmetry, absence of pectoralis muscle, or hand anomalies are visible. **Milder** cases (without obvious hand deformities) may not be noticed until later in childhood, puberty, or even adulthood when asymmetry of the chest wall or breast becomes more apparent (especially in females at puberty). [1,9,10]

Taken together, these findings suggest that the likelihood of transmitting Poland syndrome to the newborn is low and while it is reassuring that Poland syndrome is most often sporadic, with most affected individuals having no family history; some familial cases have been documented. In a larger study of **190** Poland syndrome (PS) patients and their parents, about **87%** were classified as random/sporadic, while approximately **4.2%** represented true familial recurrence (i.e., direct defects in relatives), and another **8.4%** displayed Poland-like anomalies among different family members. [15]

This suggests that overall, the **risk of recurrence is low**, particularly when neither parent exhibits any features of the syndrome. In summary, most guidelines estimate that **less than 10%** of PS cases are familial in nature. [1]

Although Poland syndrome in a mother possesses a slightly elevated risk to the newborn, it is highlighted and recommended to focus on genetic counseling and prenatal imaging.

3.3. Anesthetic Risks in Patients with Poland syndrome

1. Airway Management and Monitoring

Structural anomalies including chest wall (rib) deformities or scoliosis might present challenges for airway management affecting neck extension or intubation in patients with Poland syndrome. Preoperative imaging and physical assessment are routinely advised for these patients.

During the monitoring of the patient**:** Intravenous Anesthesia with Bispectral Index monitoring is performed while, watching for CO_2 changes and temperature shifts to detect early signs of

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malignant hyperthermia. It is also recommended that health care facilities should have dantrolene available for management of potential malignant hyperthermia crises. In cases involving potential risk in airway management, possible backup measures are recommended to be ready on standby to aid in airway monitoring and management (such as video laryngoscopy, fiber optic intubation, additionally an experienced anesthesiologist should be present for the operation. [6,7]

2. Respiratory/Ventilation Issues

Chest wall deformities which might include the absence/hypoplasia of the pectoralis muscles, rib anomalies can impair chest wall compliance and lead to **paradoxical breathing** during anesthesia even if asymptomatic at rest. This increases the risk of hypoventilation, intraoperative hypoxemia, and postoperative pulmonary complications. As a precautionary measure preoperative evaluation should assess for associated thoracic anomalies that could complicate ventilation or intubation. [7]

3. Malignant Hyperthermia (MH) Susceptibility

Standard Malignant hyperthermia monitoring (e.g. end-tidal $C0_2$, temperature and capnography) is very essential during surgical procedures in patients with Poland syndrome. Poland syndrome has reportedly potential association to an increased susceptibility to malignant hyperthermia, which is a life-threatening chain reaction to general anesthesia. This link is hypothesized to stem from shared genetic loci between Poland syndrome and malignant hyperthermia susceptibility. It is important to bring attention to the fact that no definitive causative genes have been identified for either condition and there are no documented cases of malignant hyperthermia being triggered in Poland syndrome patients during anesthesia, however, multiple case reports and reviews treat it as a **potential MH susceptibility condition** and precautionary measures are universally recommended. [6] The use of potential trigger agents such as volatile anesthetics and depolarizing neuromuscular blockers (like succinylcholine) is typically avoided. Instead, Total Intravenous Anesthesia (TIVA) regimens using propofol, midazolam, fentanyl, dexamethasone with careful **temperature and CO_2 monitoring are preferred.** [5,11]

4. Regional Anesthesia as an Alternative

Spinal anesthesia or **graded thoracic epidural anesthesia** involving the incremental dosing to achieve targeted sensory blockade, has been successfully used in Poland syndrome (e.g., for breast reconstruction), offering better hemodynamic stability, and avoiding airway and malignant hyperthermia risks though careful placement. Also, nerve blocks are an option to be taken in consideration. This approach to the analgesic needs of the patient ensures ventilation is not compromised and at the very least reduces complication during ventilation. [11]

It is vital to note that dosing with regional anesthesia is important both during and after surgical procedures. In a series of patient reports, epidural or subarachnoid techniques provided pain control and hemodynamic surgeries with no mentioned malignant hyperthermia events, provides triggers were avoided [6,16]

5. Preoperative Evaluation & Safety Planning

Comprehensive preoperative assessment for patients with Poland syndrome is crucial due to potential associated anomalies:

- **Thoracic imaging (X-ray, CT/MRI)** to inspect for rib deformities that might impair ventilation
- **Pulmonary function testing** (spirometry, arterial blood gas analysis) if indicated
- **Cardiac evaluation** (e.g., echocardiography) to rule out associated defects like dextrocardia.
- Imaging of the **subclavian vessels**, for possible vascular hypoplasia

These preoperative procedures highlight the need for a multidisciplinary approach to patients with Poland syndrome, including consultations with specialists from other departments (pulmonologist and cardiologist). [2,6]

Safety planning for patients with this condition should also include protocols for malignant hyperthermia (such as stocking on dantrolene preoperatively, and using non triggering agents), ventilation control, extensive preoperative blood work and screening for allergies. [7,17]

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In this patient mild anemia was noticed and managed proactively, however without these steps it has been reported that about 20% of Poland syndrome cases can have subtle cardiopulmonary anomalies which could be undetected without imaging or assessment. [2,6,7]

4. Conclusions

Poland syndrome is rare but important and imperative to recognize preoperatively for safe anesthetic management. Early preoperative assessment and counseling is crucial to rule out any possible cardiopulmonary anomalies along with avoidance of malignant hyperthermia triggers. In this case of mild Poland syndrome without significant thoracic involvement, subarachnoid anesthesia proved to be a safe and effective option for cesarean delivery avoiding various complications such as life-threatening malignant hyperthermia and airway compromise. It is a safe and readily available means of anesthesia for the patient and neonate.

In depth preoperative evaluation (including imaging and pulmonary function assessment), multidisciplinary collaboration (anesthesia, cardiology, gynecology and respiratory) and preparedness for malignant hyperthermia remain cornerstone principles in the preoperative management of patients with Poland syndrome.

There was noticeable limited literature on anesthetic consideration in Poland syndrome for obstetrics and gynecological patients. This case report contributes to the literature on anesthesia for obstetric patients while highlighting the viability of neuraxial techniques as a preferred option in obstetric patients with Poland syndrome, though individualized management.

Supplementary Materials: The following supporting information can be downloaded at: link to be inserted by the publisher. CARE Checklist: Completed CARE guidelines checklist for this case report.

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Abbreviations

The following abbreviations are used in this manuscript:

PS	**Poland syndrome**
MH	Malignant Hyperthermia
OD	Once daily

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TDS	3 times daily
QDS	4 times daily
IV	Intravenous
SC	Subcutaneous
PO	By mouth/oral
PRN	As needed

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