Original Article

Anesthetic Management of High Risk Obstetric Patients with Pulmonary Hypertension: An Experience at Rawalpindi Institute of Cardiology

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Abstract

Objectives: To assess the safety of mode of anesthesia in high risk patients of pulmonary Hypertension in terms of morbidity and mortality, and to compare these observations with international studies.

Methodology: This retrospective observational study was conducted at Rawalpindi Institute of Cardiology, from July 2017 till February 2019. All patients having pulmonary hypertension and undergone obstetric surgery were included. Diagnosed cases of pulmonary hypertension, who had conceived despite counseling against conception, and were registered at RIC during second or third trimester through emergency, and these patients were optimized by oral medication to control pulmonary hypertension. A multidisciplinary approach was adopted by involving gynaecologist, cardiologist, and anesthesiologist well before surgical intervention which led to a better outcome for these patients in terms of morbidity and mortality. All the information was collected via study proforma. Data was analyzed by SPSS version 20.

Results: All patients remained hemodynamically stable during anesthesia and postoperatively as was evident by postoperative TTE. Morbidity was seen in one patient who had prolonged ventilation for 3 days followed by a chest infection. There was no maternal mortality. Other patients were discharged during the week postoperatively.

Conclusion: It was observed that the optimal medical therapy of obstetric patients with PH by a multidisciplinary approach before any kind of anesthesia results in the least mortality and morbidity.

Key words: Pulmonary Hypertension, Tricuspid Regurgitation (TR), General Anesthesia (GA), Saddle Anesthesia, Trans thoracic Echocardiography (TTE), Pulmonary Artery Catheter (PAC).

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Introduction

Pulmonary hypertension is defined as mean pulmonary artery pressure [MPAP] of more than 25 mmHg at rest with a pulmonary capillary wedge pressure, left atrial pressure, or left ventricular end-diastolic pressure of 15 mmHg or less, and a pulmonary vascular resistance [PVR] of more than 3 Wood units. The normal pulmonary artery pressures are less than 1/3rd - 1/6th of systemic pressures. Pressures can rise from half to near systemic and at some occasions supra systemic. The current classification of pulmonary hypertension avoids the terms primary and secondary and the term idiopathic PAH [IPAH] is preferred. This refers to the

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sporadic cases of PAH with no familial and identifiable risk factors. In this new classification, the term heritable replaces the term familial PAH, where there is mostly mutation of bone morphogenetic protein receptor type 2 [BMPR2]. Cardiac lesions like atrial or ventricular septal defects and patent ductus arteriosus; lung diseases (COPD), connective tissue disorders (e.g., scleroderma, lupus), liver disease or certain drugs like fenfluramine may lead to pulmonary hypertension. Chronic thromboembolic pulmonary hypertension [CTEPH] is also seen in some patients.[1] Disease severity can be assessed by pulmonary arterial pressure measurement during right heart catheterization. Mean PAP between 30 to 40 mmHg is mild pulmonary hypertension. It is moderate when mean PAP is 40 to 70 mmHg. Pressures more than 70 mmHg indicate severe pulmonary hypertension.

Pregnancy in pulmonary hypertension leads to rapid deterioration of symptoms which leads to right heart failure with very high morbidity and mortality. That is why pregnancy is contraindicated in these patients as the heart is unable to handle additional hemodynamic loads of pregnancy due to a fixed left heart output.[2] According to one study in the United States, PH in pregnant females was associated with an increase in MACE, (major adverse cardiac events) during the hospitalization for delivery, and associated cardiomyopathy increased the risk many folds.[3] PH carries a very high mortality and morbidity even in developed countries and guidelines have been suggested to clinicians[4] for preconception counseling, medication management, and delivery planning. In a developing country like Pakistan, the usual presentation is in Emergency departments with heart failure. Most of these patients are poorly managed in terms of pulmonary hypertension.

Pulmonary hypertension (PH) in pregnancy is associated with high maternal mortality and morbidity roughly in the range of 30-56%.[5-7] Most patients remain undiagnosed till their mortality during pregnancy. In Pakistan, no clear data is available regarding the incidence of pulmonary hypertension in obstetric patients which has led to lack of local guidelines in the anesthetic management of these patients. The choice of anesthetic in the surgical management of patients with pulmonary hypertension also carries high risk. General anesthetic involves intermittent positive pressure ventilation (IPPV); whereas regional anesthesia may provide insufficient analgesia. Both IPPV and pain may aggravate the already existing pulmonary hypertension; thereby increasing morbidity and mortality. This study has been conducted to study pulmonary hypertension patients with pregnancy and their anesthetic management at Rawalpindi Institute of Cardiology.

Methodology

The current retrospective observational study was conducted at Rawalpindi Institute of Cardiology. The duration was from July 2017 till February 2019. All patients with pulmonary hypertension who had undergone obstetric surgery in this duration were included. The study was carried out on patients with pulmonary hypertension at RIC after the approval from Ethical Review Board. Demographic information was collected including age, gestational age, parity, right heart catheterization reports, and echocardiography findings. Informed high-risk consent was obtained after a thorough routine preoperative anesthesia assessment.

All patients were admitted to the obstetrics ward and were stabilized with medication before proceeding for the elective operative procedure. During hospitalization, the obstetrician had involved a cardiologist and anesthetist and detailed discussions for peri-operative optimization were done. A standardized approach was adopted during anesthetic management. Invasive arterial and central venous lines were placed under local anesthesia and ultrasound guidance before anesthesia along with noninvasive monitoring. Standardized general anesthesia was induced with Inj. Etomidate and Endotracheal intubation was facilitated by Inj. Atracurium according to body weight. Anesthesia was maintained with Sevofluarne in 100% Oxygen and IPPV. Injection Nalbuphine and Transamine were given after delivery of the baby. 20 mg of Injection Lasix was given. Anesthesia was reversed on 100% Oxygen, switching off Sevoflurane and reversal of muscle relaxation with Injection Neostigmine and Injection Pyrolate. Under aseptic technique, Saddle anesthesia was provided with 10 mg of 0.75% hyperbaric Bupicaine at L3-4 interspace in sitting position and strict saddle effect was achieved. In both anesthetic techniques, 5 IU of Inj. Syntocinon were given in 100 mL normal saline over 5 minutes (Departmental Protocol) after the delivery of baby/ evacuation of retained products of conception. Patients were shifted to intensive care unit for postoperative management.

The medical therapy was restarted postoperatively after NPO was over. Patients had bedside Transthoracic

echocardiography (TTE) on day 1 postoperatively and then before discharge from Hospital. Morbidity in terms of prolonged hospital stay, prolonged mechanical ventilation, right heart failure, uterine atony and infection; and mortality were recorded. All the data was recorded in study proforma. Data was analyzed by using SPSS version 20.

Results

The study included 13 patients of pulmonary hypertension with pregnancy managed under anesthesia. All patients were diagnosed cases of PH admitted through an emergency. One patient was admitted due to right heart failure whose ejection fraction (EF) decreased during hospitalization. Others had no or minimal symptoms. The ages ranged from 21 to 34 years; parity ranged from primipara (PG) to gravida 7 with no live issue. The gestational age range was 6 to 37 weeks. TR was present with a mean gradient of 76 mmHg. (Range between 40- 92 mmHg).

In 5 patients, cardiac lesion in addition to PHN was seen on Echocardiograph. Two had un-corrected Ventricular Septal defect (VSD) and Eisenmenger's syndrome (ES) (n= 2); one had VSD corrected with VSD patch, one case had severe MR with global hypokinesia and dilated cardiomyopathy; while two patients had concurrent Pulmonary stenosis (PS). Overall, 10 patients had severe Pulmonary Hypertension with PAP > 70mmHg (range 72-92); 2 had moderate PH with PAP 65 mmHg. Only 1 patient had mild PH with PAP 40mmHg and mild TR. She was operated under saddle block. The other patient given saddle anesthesia had PAP 78mmHg and TR++. Both patients tolerated saddle anesthesia well. General anesthesia was uneventful in all other patients with moderate to severe PH.

Eight patients were delivered through cesarean section, (n=8) out of whom 6 had severe PH. The other 2 had moderate PH with a PAP 65mmHg and severe TR. General Anesthesia was uneventful in these patients.

Five patients had evacuation of retained products of conception. Saddle block was successful in two patients (n=2), of whom one had severe PH with Eisenmenger's Syndrome and the other had moderate PH and mild TR. The other three patients had severe PH and received uneventful general anesthesia.

All cesarean sections were done under general anesthetic and had uneventful intra- and postoperative course except one who had morbidity of prolonged postoperative ventilation and delayed discharge after two weeks. Other 7 patients were discharged after one week postoperatively. For evacuation and curettage, 3 patients were given general anesthesia and 2 were given saddle block for the evacuation of RPOCs, and all were discharged after one week. There was no maternal mortality in our study. All patients remained hemodynamically stable during anesthesia and postoperatively as was evident by postoperative TTE. All patients were followed up in OPD.

Table I : Demographic.

S. No.	Age	Parity	Gestational Age	Cardiac Lesion	Severity of TR	PAP	Mode of Anesthesia	Procedure	Fetal Outcome
1	29 yrs	G2p1	36 wks	PHTN	TR++	84 mmHg	GA	El LSCS+ BTL	MC 3kg A/H
2	21yrs	G4p0+3	7wks	ES, PHTN, VSD	TR++, VSD 2.3mm, Rt to Lt shunt	78mmHg	SA	D and C	-
3	26yrs	PG	37+ wks, breech	PHTN	TR++	82mmHg	GA	El LSCS	FC 2.7kg A/H
4	30yrs	PG	28wks	ES, PHTN, VSD	TR++	85mmHG	GA	LSCS	MC 2.2kg A/H
5	31yrs	G2p0+1	36+wks	PHTN, PS	TR++	65mmHg	GA	LSCS	FC A/H
6	32yrs	G3p2, no alive issue	26wks	PHTN	TR++	79mmHg	GA	D and C for expulsion at home	-
7	32yrs	G3p2	6+wks, previous home deliveries	PHTN	TR++	86mmHg	GA	D and C+ BTL	-
8	21yrs	PG	29+wks	PHTN	TR+	40mmHg	SA	SVD @ home D and C for RPOCs	FC A/H
9	30yrs	G7, no alive issue	12 wks	PHTN	TR+++	92mmHg	GA	D and C for expulsion at home	-
10	21 yrs	PG	35+ wks	PHTN	TR+++	79mmHg	GA	LSCS	FC A/H
11	34 yrs	PG	35+ wks	VSD Patch, PHTN, severe MR, global Hypokinesia, dilated cardiomyopathy	TR+++	65mmHg	GA	LSCS	FC A/H
12	32 yrs	PG	35+ wks	PHTN, PS	TR+++	72mmHg	GA	LSCS	MC A/H
13	29 yrs	PG	35+ wks	PHTN	TR+++	80mmHg	GA	LSCS	A/H

Table II: Mode of Anesthesia (n=13)		
Mode of anesthesia	**General**	**Saddle**
Cesarean delivery	8	-
Dilatation and curettage D &C	3	2
Total	**11**	**2**

Table III: Grade of Pulmonary Artery Pressure and Tricuspid Regurgitation (n=13)				
Total Number	PAP > 70mmHg	PAP < 70 mmHg	TR Plus 2 or 3	TR Plus 1 or Nil
13	10	3	12	1

Discussion

In Pakistan, the Incidence and Prevalence of pulmonary hypertension is unknown. Although any age can be affected, however, women aged between 21 and 40 years make the main population. In this study age range was between 21-34 years. Similarly, in retrospective data mean age was found 32±9 years.[8] On other Sliwa K et al[9] also found maternal mean age 29.2 ± 5.6 years in pregnant women with pulmonary hypertension and these findings were near to this study.

In this study, all patients were diagnosed cases of PH who had conceived despite counselling against conception. Eight patients were delivered through cesarean section, out of whom 6 had severe PH. General Anesthesia was uneventful in these patients. Five patients had evacuation of retained products of conception. Saddle block was successful in two patients, of whom one had severe PH with Eisenmenger's Syndrome. The other three patients had severe PH and received uneventful general anesthesia. Anesthetic management of pregnant patients with pulmonary hypertension carries risks for both mother as well as the fetus and is a challenge for the anesthetist due to many unavoidable factors which may worsen the magnitude of PH intraoperatively. A spectrum of gravity is the same for all classes of pulmonary hypertension.[10] One study managed a parturient with Primary PH who underwent elective cesarean section under epidural anesthesia.[11] The intraoperative and postoperative course was uneventful. Another case report of a 28-week pregnant woman with severe Primary PH who had an elective Caesarean section under general anesthesia at 32 weeks gestation where intraoperative nitric oxide was used to reduce PAP. [12] A recent study concluded that termination of pregnancy should be sought in all patients with idiopathic pulmonary hypertension. Those patients who still conceive or wish to continue pregnancy should be started and adjusted to specific therapy for PH. They suggested elective cesarean delivery in 34-36 weeks under epidural or low-dose combined spinal-epidural anesthesia whereby the attending anesthesiologist must be well aware of the merits and demerits of the mode of anesthesia.[13,23,24.]

In this series, all patients remained hemodynamically stable during anesthesia and postoperatively as was evident by postoperative TTE. Morbidity was seen in one patient who had prolonged ventilation for 3 days followed by a chest infection. This patient had received general anesthesia with endotracheal intubation and there was no maternal mortality in our study. On other hand, a case study described the anesthetic management of a patient with PH who was diagnosed at 32 weeks gestation, optimized in hospital, and delivered through cesarean under epidural. Poor prognosis led to recurrent heart failure at 6 weeks post-partum and CVA and cardiac arrest at 6 months. [14] Another study showed 25 % mortality exists irrespective of the mode of anesthesia in these patients.[15] However, a study could not identify any factors, including modes of anesthesia, and delivery, and categories and severity of pulmonary hypertension as significant predictors of mortality. They suggested a multidisciplinary approach for pregnant women with pulmonary hypertension. Similarly, another effort was presented as case series of five pregnant patients with PH successfully managed with a standardized multidisciplinary treatment approach. [16, 17] In a case report published in 2002, it was suggested that ECMO should be considered for the perioperative management of patients with severe PPH to prevent circulatory failure or as a bridging therapy before lung transplantation.[18] Thorough multidisciplinary planning, careful intraoperative management, and early recognition and treatment of postoperative complications are key elements to decrease morbidity and mortality in pregnant women with PH.[19] With pregnancy, management must be individualized, and patients should be cared for as part of an experienced multidisciplinary team.[20] results of our study are comparable, where a multidisciplinary approach was adopted in the management of obstetric patients with PH. A review of data on Pregnancy in pulmonary hypertension concluded that despite advanced therapies, pregnant patients with pulmonary hypertension have high mortality, especially in the

postpartum period. Ideally, women should be advised against pregnancy, but if a woman chooses to continue with their pregnancy, they should be managed at specialized centers with experience in managing PAH during and after pregnancy.[21, 22]

Conclusion

Based on our study, it is suggested that early recognition and medical management are helpful and can better guide anesthetic management in obstetric patients with pulmonary hypertension. Multidisciplinary approach and planning are essential. TTE is diagnostic and can be safely used for risk stratification. Mild PH seems to be low risk, but monitoring with TTE is essential if becomes symptomatic. PAC is invasive, however; newer noninvasive or semi-invasive modalities may be more appropriate. Saddle anesthesia is safe in selective sub-groups of these patients as Epidural analgesia and anesthesia for labor and operative delivery is an acceptable choice. General anesthesia is safe and is the choice in emergent or unstable cases. Regardless of the choice of anesthesia, preoperative optimization of cardiac status through a multidisciplinary approach and postoperative intensive care provides better results in terms of morbidity and mortality. Further experience in this group of obstetric patients is needed.

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