Optimal Maternal-Fetal Interface Environment Affects Neonatal Viability in Preterm Preeclampsia and IUGR Pregnancy

Novi Resistantie,[1] Semuel,[1] Cindy Fawwaz Roviqoh,[1] Taufik Ramdani[2]
[1]Department of Obstetrics and Gynecology,
Bhayangkara Tk. I R. Said Sukanto Police Hospital, Jakarta
[2]Faculty of Medicine, Universitas Pembangunan Veteran Jakarta
Korespondensi: Novi Resistantie, Email: noviresis.post@gmail.com

Abstract
Objective: to report rare case of fetal viability on preterm pregnancy with preeclampsia and IUGR
Methods: case report
Case: A 29-year-old woman (G1P0A0) at 29 weeks of gestation, came to the Obstetrics and Gynecology Outpatient Clinic of Bhayangkara Tk. I R. Said Sukanto Police Hospital Jakarta with complaints of left-sided headache since 25 weeks of gestation. After examination, the patient was diagnosed with preeclampsia with IUGR. The caesaria section was performed at 28 weeks and a baby was born with BW: 850 grams, BL: 31 cm, and an APGAR score of 5/6. No inflammatory cells were found in chorionic villi. The baby continues to live after being treated in the NICU for 30 days.
Conclusion: Optimal maternal fetal interface environment secures neonatal viability.
Key word: Fetus Viability, Inflammation, IUGR, Preeclampsia.

Lingkungan Antarmuka Maternal-Fetal yang Optimal Mempengaruhi Kelangsungan Hidup Neonatal pada Kehamilan Prematur dengan Preeklamsia dan IUGR

Abstrak
Tujuan: untuk melaporkan kasus jarang viabilitas fetus pada kehamilan preterm dengan preeklampsia dan IUGR
Metode: laporan kasus
Kasus: Seorang perempuan berusia 29 tahun (G1P0A0) dengan usia kehamilan 29 minggu, datang ke Poliklinik Obstetri dan Ginekologi Rumah Sakit Bhayangkara Tk. I R. Said Sukanto Jakarta mengalami pusing pada kepala sebelah kiri sejak usia kehamilan 25 minggu. Setelah pemeriksaan, pasien didiagnosa mengalami preeklamsia dengan perburukan IUGR. Operasi Seksio sesarea dilakukan pada usia kehamilan 28 minggu dan lahir seorang bayi dengan BB: 850 gram, PB: 31 cm, dan skor APGAR 5/6. Tidak ditemukan sel yang mengalami inflamasi pada vili chorionic. Bayi tetap hidup setelah dirawat di NICU selama 30 hari.
Kesimpulan: Interaksi maternal fetal yang optimal menjamin viabilitas fetus.

Kata Kunci: Inflamasi, IUGR, Preeklamsia, Viabilitas Fetus, Preeklamsia.

Introduction

Preeclampsia is one of the most common pregnancy complications in developed and developing countries, which may lead to IUGR. There are 4,6% of pregnancies complicated by preeclampsia worldwide, with 1,4% delivery from preeclampsia and eclampsia pregnancies.[1] In Asia, the incidence of preeclampsia ranged by 0,2 –6,7%.[2] In Indonesia, the incidence of preeclampsia is 128.273 per year or equal to 5,3%. [3] Preeclampsia diagnosis is determined by hypertension in pregnancy and is usually accompanied by one or more new conditions such as proteinuria, other maternal end-organ dysfunction, and uteroplacental dysfunction after 20 weeks of gestation.[4]

In preeclampsia, spiral arteries' blood flow tends to be low due to abnormal placentation and systemic vascular dysfunction.[5] The dysfunction in placental endothelial tissues could lead to hypertension and Intrauterine Growth Restriction (IUGR).[6]

Neutrophil Lymphocyte Ratio (NLR) is used as a marker of inflammation. Antenatal inflammation is strongly associated with preterm birth, IUGR, and stillbirth. High levels of NLR values in the first trimester appear to show an increase in inflammation during pregnancy. The rise in inflammation in the placenta correlates with the presence of Intrauterine Growth Restriction.[7]

Intrauterine Growth Restriction (IUGR) or Fetal Growth Restriction (FGR) is a fetal growth disorder that has been an outcome of fetal hypoxia, which can cause morbidity and mortality. Thus, we report a case of IUGR in preeclampsia, which delivered a longer live baby.

Method

The study was conducted in March 2022 by using a case report method with ethical clearance from Bhayangkara Tk. I R. Said Sukanto Hospital KET/EC-10/VII/2022/ RS.BHAY.TK.I tgl 20 Juli 2022. Client history and physical examination were made to collect the primary data. The secondary data is used from the result of laboratory and medical records.

Case Report

A 29-year-old woman (G1P0A0) at 29 weeks of gestation, came to the Obstetrics and Gynecology Outpatient Clinic of Bhayangkara Tk. I R. Said Sukanto Police Hospital Jakarta with complaints of left-sided headache since 25 weeks of gestation. Pain radiates to the neck, feels tense, and difficult to move the head. The patient complains of dizzy vision, the body feels weak, and both legs are swollen. The patient complains of a tight stomach but can't remember how many times it happened in a day. The patient denied other complaints such as heartburn, nausea, vomiting, seizures, and vaginal discharge. The patient routinely performed ANC; the last was on February 18, 2022.

On physical examination, the general condition was found to be moderately ill, with vital signs of high blood pressure of 140/90 mmHg, HR 92x/minute, RR 20x/minute, and temperature 36.5°C. Nutritional status before pregnancy was normal. The results of the obstetric examination showed that the uterine fundal height was 18 cm, the estimated fetal weight was 1085 g (based on the Johson Toshack formula), and the position of the fetal back on the left side of the mother with fetal heart rate 148 x/minute.

On laboratory examination, the results obtained were hemoglobin (12.0 g/dL), hematocrit (35%), leukocytes (12.210/ µl), platelets (190.000/µl), erythrocytes sedimentation rate (109 mm/h), D dimer (2.21 ng/ml), prothrombin time (8.2"), activated partial thromboplastin time (30,9") and NLR (2,79). Urinalysis examination revealed protein (3+), leukocytes (1+), epithelial cells

(2+), cylinders (hyaline 2-3, granules 0-1), and bacteria (1+). Fetomaternal ultrasound examination revealed a single live fetus, cephalic presentation, fetal biometry 28 weeks 1 day, estimated fetal weight 941 grams in the 5th percentile, amniotic fluid index 7.58 cm below the 5th percentile, placenta in fundus size 168.05 cm^3, according to with a small placenta, there is a twist of the umbilical cord 2x around the neck. This corresponds to hypoperfusion of maternal placental hypoxemia and fetal placenta. Possibility of the fetus in conditions of high risk of hypoxia and worsening.

Patients were treated with IVFD RL 500 cc + MgSO4 4 g, nifedipine 3 x 10 mg, dopamet 3 x 250 mg, dexamethasone 15 mg 1 x 1 im given for 2 days. Then given with D5: RL ratio of 1: 1 after being given MgSO4 in 24 hours. Delivery was planned with caesarean section.

After treatment for 6 days, the baby was delivered with a cesarean section. During the operative procedure, after the peritoneum was opened, clear ascites were ± 500 cc. The baby girl was born with a birth weight of 850 grams, a birth length of 31 cm, and an APGAR score of 5/6. The baby was crying, groaning, and suctioning was done. Due to the shortness of breath, cyanosis, and rhonchi, the baby was taken care of in the NICU. The placenta was delivered, measuring 15 x 13 x 1.5 cm and weighing 200 grams. The placenta was sent to anatomical pathology for examination.

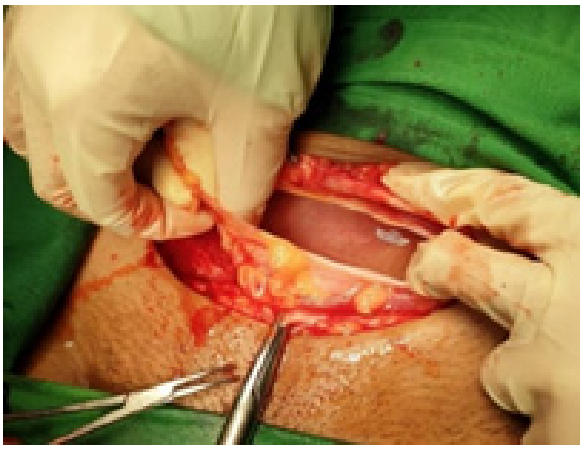

Figure 1 Intraoperative. Showing Clear Abdominal Ascites ± 500 cc

Table 1 Ultrasound Examination Result

	Ultrasound Examination Result			
	18 February 2022		23 February 2022	
EFW (grram)	941		1013	
AFI (cm)	7,58		3,72	
Q1	2,47	2,47	0,41	0,41
Q2	3,68	3,68	1,58	1,99
Q3	2,51	6,19	0,68	2,67
Q4	1,39	7,58	1,05	3,72
Uterine Artery	Right	Left	Right	Left
S/D	3,18	3,65	3,10	3,39
PI	1,40	1,54	1,36	5,66
RI	0,69	0,73	0,68	1,29
Notch	√	√	√	√
Umbical Artery				
S/D	2,85		5,64	
PI	0,65		1,83	
RI	1,03		0,98	

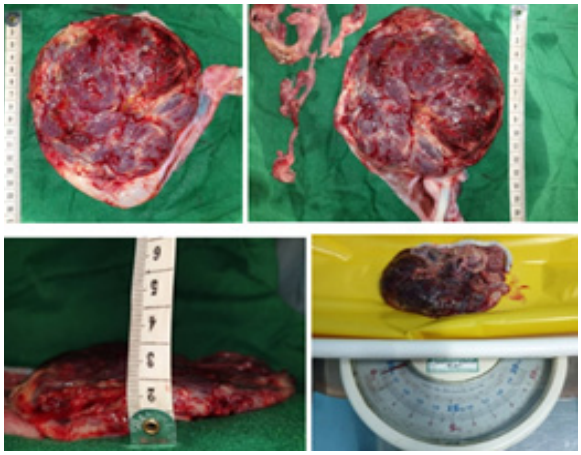

Figure 2 Placenta the Placenta Measures 15 x 13 x 1.5 cm, Weighs 200 grams, and is Examined for PA

The PA examination of the placenta showed that the placental tissue contained chorionic villi, which generally looked degenerative, lined by 2 layers of trophoblast cells. Syncytial knots were found. No inflammatory cells were found in the chorionic villi. Found blood vessels with thickened walls. Decidual tissue was found.

Discussion

According to The International Society for The Study of Hypertension in Pregnancy (ISSHP) 2021, the diagnosis of preeclampsia was made based on the existence of high blood pressure accompanied by the appearance of end-organ and uteroplacental dysfunction. In this case, the patient had a high blood pressure (140/90 mmHg), proteinuria, and uteroplacental dysfunction, which are Fetal Growth Restriction (FGR) (<5th percentile estimated fetal weight).[4]

The presence of FGR, also known as Intrauterine Growth Restriction (IUGR) in preeclampsia appears to be the outcome of fetal hypoxia which then encourages the production of Reactive Oxygen Species (ROS). The damage around the placenta caused by ROS has led to decreasing oxygen and nutrition transport to the fetus.[8] Thus, fetal growth becomes limited, so that fetal weight decreases and body shape is altered.[9]

In this case, the signs of hypoxia are shown by the twice umbilical cord entanglement around the fetal neck, uteroplacental index, and notch on the right and left side of uterine arteries. Besides, the placental damage can be shown through the small size of the placenta (200 gram), the existence of syncytial knot and chorionic villi in the placental tissue, the degenerative look, and oligohydramnios.

It has been found that placental disturbance and the interaction of placenta and maternal genetic predisposition to cardiovascular and metabolic disease cause preeclampsia. The problems around placenta inhibit the development of the cytotrophoblast shell which is the source of extravillous trophoblast cells (EVT). EVT is needed for the maternal spiral arteries remodeling process.[10] The impaired spiral arteries are associated with the findings of high abnormal impedance to blood flow in uterine arteries. Maternal endothelium dysfunction is one of the maternal inflammatory responses to oxidative stress during preeclampsia. This may initiate vasoconstriction and decreased blood flow to organs such as the kidney, heart, and brain. Eventually could affect some perinatal outcomes.[11]

IUGR has short and long-term effects on the fetus. In the short term, IUGR appears to be the most common risk factor of stillbirth for up to 50%.[12] In the long term, impairment of organs in cardiovascular, pulmonary, and neurological might exist and affect its viability.[13]

The highlight of this case is the baby is alive after being treated in the NICU for 30 days. It appears that there are no inflammatory cells found in the chorionic villi in utero. It's signed with the normal leukocytes, low NLR, and the existence of decidual cells.

The decidual cells are a differentiation

of endometrial cells in early pregnancy, which contains leukocytes with subsets of maternal immune cells such as natural killer (NK) cells, macrophages, T cells, B cells, and dendritic cells (DC).[14–16] Previous findings show that NK cells contribute to trophoblast invasion and spiral artery repairment, and with the help of macrophages as antigen-presenting cells, initiate phagocytosis, secret cytokines, and encourage homeostasis process in the immune system among the fetus and maternal.[17] This might be the factor that facilitates the fetus to have great viability.

Preterm and term IUGR, preeclampsia, fetal death, and preterm labor have an association with inflammation in chorionic villi.[18] Other studies found that inflammation may happen not only in the fetal and maternal but also in the endometrium environment. Therefore, we suggest further investigation of factors associated with in the inflammation process at the inter and intra placenta in preeclampsia and IUGR pregnancy.

Conclusion

Preeclampsia is a complication during pregnancy leading to another disorder, IUGR. IUGR is caused by fetal hypoxia due to abnormality in the placental spiral arteries. IUGR is associated with inflammation in the placenta and fetus viability. A hematology test and PA examination should be done to assess the patient immune state. Thus, the baby could be delivered safely and have a longer time to live.

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