Vascular and Malperfusion Lesions of the Placenta are Associated with Expedited Birth Due to Suspected Fetal Compromise

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Introduction

Placental pathology examination is used to investigate adverse obstetric and neonatal outcomes. There is extensive placental pathology research regarding certain adverse obstetric outcomes, such as preterm birth, and known differences in the rates of placental pathology across gestation[1,2] However, there is limited research regarding the relationship between expedited birth due to suspected fetal compromise and placental pathology,[3] despite its use as an indication for examination in tertiary level facilities, including Monash Health.[4] Placental pathology can be broadly split into malperfusion/vascular lesions and infectious/inflammatory lesions. Some examples of these pathologies are presented in Figure 1.

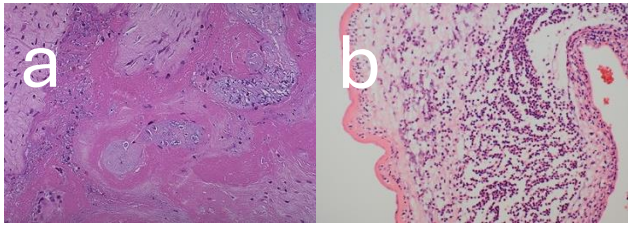


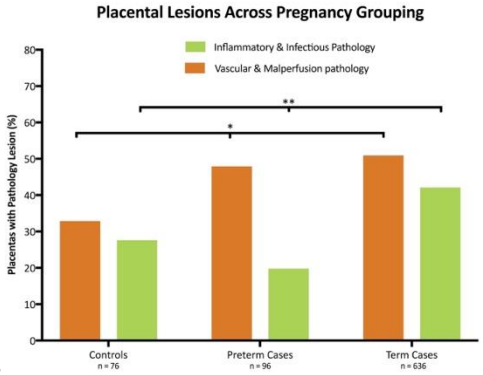
Fig. 1 Placental Lesions Taken from Mercer University School of Medicine[5]
1a. Placental infarction (arrow) on microscopic examination, an example of vascular/ malperfusion placental pathology; 1b. Microscopic evidence of chorioamnionitis, an example of infectious/inflammatory lesions

Aims

- Identify the prevalence of expedited birth due to suspected fetal compromise at Monash Health and the proportion of these cases receiving a placental pathology examination
- Identify placental pathology lesions that related to expedited birth due to suspected fetal compromise
- Identify if placental pathology lesions related to neonatal outcomes

Methods

- **Placental pathology reports** from expedited births due to suspected fetal compromise and from the control group, uncomplicated, late preterm births (34-36+6 weeks gestation) were obtained from Monash Health; **Maternal Demographics, pregnancy complications and neonatal outcomes** were obtained from Monash Health Birth Outcome Summary (BOS) data
- Maternal demographics, pregnancy complications, neonatal outcomes and placental lesions were compared between controls, preterm cases (34-36+6 weeks) and term cases (37+ weeks) using Chi^2 and Kruskal-wallis tests; rates of adverse neonatal outcomes were compared to placental lesions
- The relationships between placental lesions, pregnancy grouping and neonatal outcomes were assessed using logistic regression, adjusting for covariates – maternal age, body mass index, country of birth, smoking status & neonatal outcomes



Results

Rates of Placental Pathology Examination

1952 (**23.3%**) births are Monash Health in 2016 were expedited due to suspected fetal compromise

- 112 (1.3%) between 34 and 36+6 weeks
- 1840 (22.0%) 37 or greater weeks gestation
- 733 (37.5%) placental pathology reports

Placental Lesions

Rates of some placental lesions are depicted in Figure 2 and adjusted odds ratios are presented in Table 1. Preterm and term expedited births had 2.0 and 2.2 times the odds of having a vascular/malperfusion lesion compared to the control group. Term expedited births had 1.8 times the odds of an infectious/inflammatory lesion compared to controls.

Table 1. Association between birth group and placental pathology

Placental Pathology	Adjusted* OR (95% CI)	P Value
Vascular/Malperfusion		
Preterm Cases	2.0 (1.1 – 3.8)	0.034
Term Cases	2.2 (1.3 – 3.7)	0.003
Infectious/Inflammatory		
Preterm Cases	0.6 (0.3 – 1.2)	0.129
Term Cases	1.8 (1.1 – 3.2)	0.027
Chorioamnionitis		
Preterm Cases	0.3 (0.1 – 0.8)	0.018
Term Cases	2.6 (1.3 – 4.9)	0.005

Association between placental lesions and birth group, compared to controls (uncomplicated late preterm births), determined using logistic regression
*Adjusted for maternal age, BMI, country of birth, smoking status and neonatal sex

Neonatal Outcomes

Regardless of pregnancy grouping, neonates who had a vascular/malperfusion placental lesion had a 1.5 times the odds of being small for gestational age compared to those without these placental lesions. Neonates who had an infectious/inflammatory placental lesion had 2.0 and 1.5 times the odds of being admitted to special care nursery (SCN) or neonatal intensive care unit (NICU), and having a neonatal morbidity respectively, compared to those who did not have these placental lesions.

Table 2. Association between neonatal outcomes & placental pathology

	Adjusted OR (95% CI)*	P Value
Infectious/Inflammatory		
SCN/NICU Admission	2.0 (1.5 – 2.7)	<0.001
Neonatal Morbidity	1.5 (1.1 – 2.0)	0.014
Chorioamnionitis		
SCN/NICU Admission	2.8 (2.0 – 3.9)	<0.001
Neonatal Morbidity	1.9 (1.3 – 2.7)	0.001

Association between placental lesions and birth group, compared to placentas without specific lesion, determined using logistic regression
*Adjusted for maternal age, BMI, country of birth, smoking status and neonatal sex; SCN = special care nursery; NICU = neonatal intensive care unit

Discussion There is significant evidence that vascular/malperfusion placental lesions are related to expedited births and small for gestational age, whilst infectious/inflammatory lesions are related to neonatal morbidity and neonatal admission, regardless of pregnancy grouping. This study is the first of its kind to explore the relationship between placental pathology and expedited births due to suspected fetal compromise, and further exploration could help stratify compromised fetuses and identify those at greatest risk of morbidity and mortality.

References
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