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The Association of Various Placental Lesions with Perinatal Outcome in Preterm Births

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ABSTRACT

Objective: Present study was designed to identify various lesions in placenta and investigate their impact on neonatal and perinatal outcome and also to determine the frequency of various inflammatory lesions in placenta.

Materials and Methods: Placentae of 60 singleton non-anomalous preterm births were examined at Department of pathology at Tertiary care centre. Complete placental examination including both macroscopic and microscopic examination with the help of Haematoxylin and Eosin staining done. Thereafter placental lesions were classified according to Redline criteria for classification of placental pathology. Thereafter placental lesions were correlated with perinatal mortality and neonatal morbidity in early neonatal period. The relevant clinical details were collected from the obstetric clinical records and neonatal clinical records.

Result: We found placental vascular processes as most frequent (73.33%) pathological lesion in our study. Most common inflammatory lesion in our study was chorioamnionitis (15%). Also among placentae of stillbirths, placental vascular lesions were predominant finding present in 85.7% of placentae of stillbirths. Other lesions found in placentae of stillbirths were Immune inflammatory lesions, maternal floor infarction and placenta accreta.

Out of total placentae with vasculopathy, 19.2% cases developed neonatal sepsis, in chorioamnionitis group 66.6% live births were having sepsis.

In present study we observed higher frequency of resuscitation in babies with placentae having chorioamnionitis.

Discussion: This study revealed that the placental pathological findings appear to be correlated with perinatal mortality and early neonatal morbidity. So, examination of the preterm placentae gains importance in early determination of morbidity in infants. Placental findings can help neonatologist in routine diagnosis and management.

Key Words: Placenta, Placental pathology, Preterm births, Perinatal outcome

INTRODUCTION

Placenta is the least understood and one of the most important human organs, not only for the health of a woman and her fetus during pregnancy but also for the lifelong health of both. The placenta is the link between the mother and the fetus. Thus, disturbed placental function can lead to various adverse fetal outcomes.[1,2] The histopathological examination of the placenta may provide crucial information. It is possible to identify placental or fetal conditions that can be recurrent or inherited.[3]

Placental pathology has been implicated in the pathogenesis of preterm neonatal morbidity. Maternal disease affecting the placental circulation or intrinsic placental pathology can lead to fetal growth restriction or stillbirth.[4]

Present study was designed to identify various lesions in placenta and

investigate their impact on neonatal and perinatal outcome and also to determine the frequency of various inflammatory lesions in placenta.

MATERIALS AND METHODS

This is a prospective observational study carried out at our Tertiary care centre duration from 2016 to 2018. This study included 60 placentae for histopathological examination. Only placentas that from preterm deliveries (whose gestational age is above 20 weeks and below 37 weeks) were selected for study. Placentas from the preterm births were studied for any evidence of pathology. Mortality including stillbirth and neonatal morbidity in early neonatal period was analysed.

Placentae from multiple gestation pregnancies, newborns with birth defects were excluded. Placentae from fetus about which clinical details were not available and placentae with improper fixation were also excluded from the study. Complete placental examination including both macroscopic and microscopic examination with the help of Haematoxylin and Eosin staining was done. Amsterdam group consensus criteria and definitions were used to diagnose various lesions[5]. Lesions were classified according to classification by Redline et al[6]. Placental lesions are studied in accordance with perinatal outcome by ascertaining placental lesions in main three groups-Placental vascular processes, chorioamnionitis, No pathology. Placental vascular processes consist of maternal stromal vascular processes and fetal stromal vascular processes. Chorioamnionitis includes both infective and immune causes of chorioamnionitis, subgroup of placental immune inflammatory lesions. Placentae without any pathology were ascertained to group 'no pathology'.

RESULT AND OBSERVATIONS

A. Clinical Characteristics – In Our study Mean birth weight was 1771.2 gm.65% (n=39) babies were born alive while 35% (n=21) babies were stillborn. Out of total livebirths 10.2% (n=4) babies were small for gestational age.

Extreme preterm births (<28 weeks) were 11.67 %(n=7).Very preterm births (28-31 weeks) were 16.66% (n=10), Moderate preterm births (32-33 weeks) were 20%. Late preterm births were 51.67% (n=31).

B. Placental examination- Shape of the placenta was circular 60% (n =36) and 40% (n=24) were of oval shape. Mean placental thickness was 2.65cm. Eccentric insertion of cord was the commonest i.e. (61.6%, n=37) while marginal insertion was least common i.e. 6.6 %(n=4), rest cases being those with central cord insertion.

Table No. I Placental lesions according to classification by Redline et al[6]

Placental lesion	n	Percentage
Placental vascular processes (PVP)	44	73.33%
Placental Inflammatory Immune Processes (PIIP)	14	23.33%
Maternal floor infarction (MFI)	6	10%
Placenta Accreta (PA)	3	5%
No pathology	10	16.66%

Total may exceed as more than one lesion were coexisting in same case.

Placental vascular processes were most frequent (73.33%, n=44) pathological lesion, which were subdivided into maternal (n=30) and foetal (n=33) stromal vascular lesions. There were 3 cases of developmental vascular lesions, while 29 cases of maternal vascular malperfusion. Fetal stromal vascular developmental lesions and fetal vascular malperfusion were found in 20 cases each and loss of integrity in fetal circulation was found in 12 cases.

Placental immune inflammatory lesions were subdivided into two groups' infectious lesions and immune lesions. 9 cases of infectious type and 5 were immune type. Infectious lesions included 7 cases with acute chorioamnionitis and one case each of acute deciduitis, chorionic vasculitis and acute intervillositis were found. In immune lesions we found two cases each of chronic villitis, chronic deciduitis and chronic chorioamnionitis. Total exceed as

more than one lesion coexisting in same cases.

C. Frequency of caesarean section and placental pathology-

In our study we found highest frequency of caesarean section when placentae are affected by vasculopathy i.e.43.2 % (n=19) and lowest in chorioamnionitis group i.e.33.3.% (n=3).40 % cases with no pathology also undergone caesarean section.

D. Placental lesions and perinatal outcome –

Placental vascular lesions were most common findings in stillbirth cases (85.7%) while second most common lesion was immune inflammatory lesion. Acute chorioamnionitis was the most common immune inflammatory lesion 19(n=4) in placentae of stillbirth.

Table no.II - Placental lesions in stillbirth cases

Placental pathology	No. of placentae in stillbirth	Percentage
Placental vascular lesions	18	85.70%
Placental immune inflammatory lesions	10	47.60%
Maternal floor infarction	4	19%
Placenta accrete	1	4.70%

Table-III- Comparison of placental findings with Neonatal parameters

Placental pathology	Mean GA	Neonatal sepsis	Babies who required resuscitation
No pathology(n=10)	34.6	0%(0)	20%(2)
Placental vascular processes(n=26)	31.8	19.2%(5)	61.5%(16)
Chorioamnionitis(n=3)	30.8	66.6%(2)	66.6%(2)

GA-Gestational age. Figures in bracket shows number of cases.

Mean gestational age was highest with placentae without any abnormality whereas found lowest with placentae with chorioamnionitis. Highest proportion of babies with placentae showing chorioamnionitis (66.6%) found to be susceptible to neonatal sepsis and also required resuscitation after birth (66.2%).

PHOTOGRAPHS:

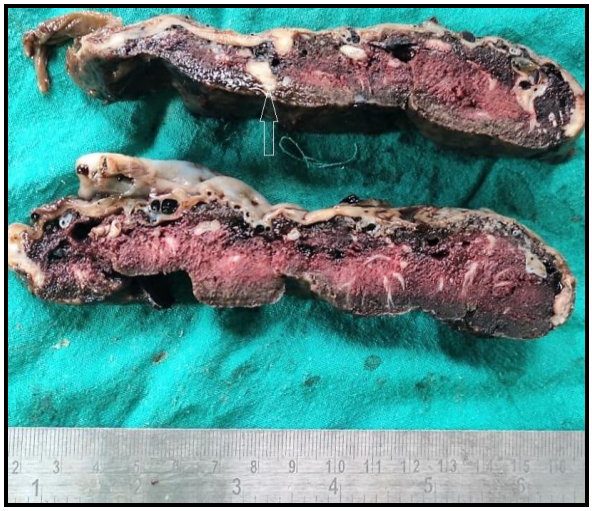

FIG.1- Photograph showing cut section of placenta showing multiple whitish yellow plaques of fibrinoid deposition.

Placental vascular processes- i) Maternal stromal vascular processes-

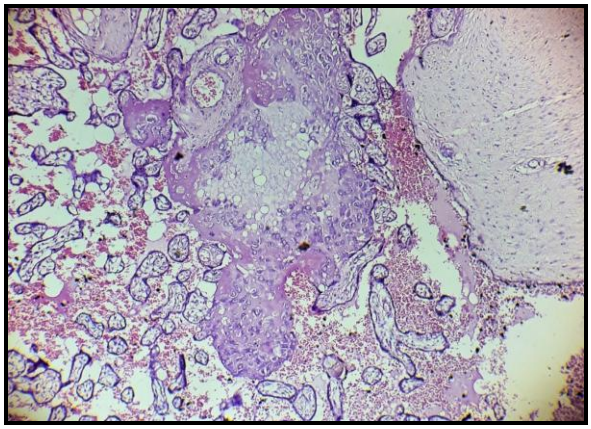

FIG.2-Intraplacental-type immature extravillous trophoblast-(10XView, Hematoxylin and eosin stain):Photomicrograph showing Large trophoblast island embedded in fibrinoid, with central cystic degeneration (pseudocyst-formation) containing pink-staining, non-haemorrhagic fluid.

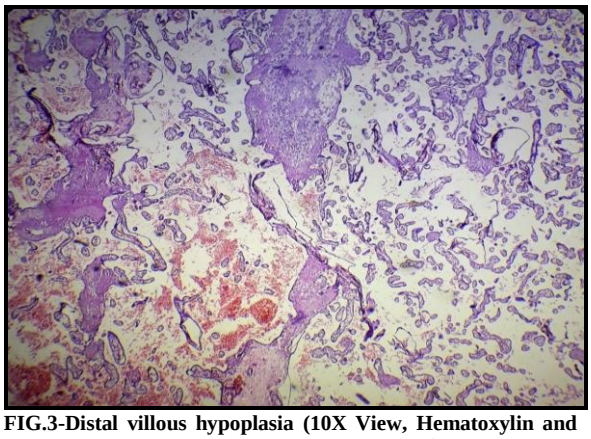

FIG.3-Distal villous hypoplasia (10X View, Hematoxylin and eosin stain)-Photomicorgraph shows paucity of distal villi.Villi are slender,long and elongated with widening of intervillous space.

Placental vascular processes- ii) Fetal stromal vascular processes

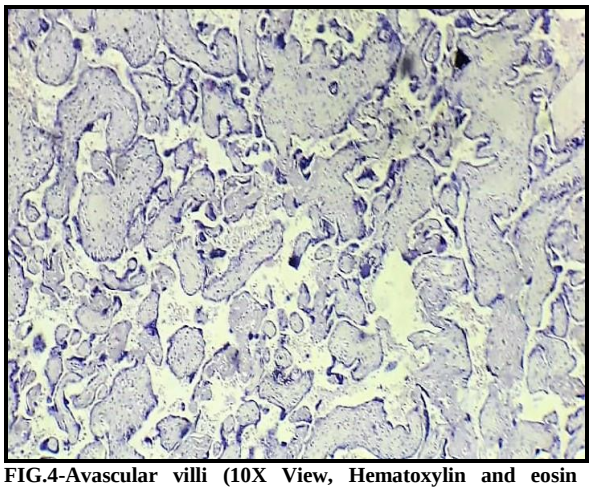

FIG.4-Avascular villi (10X View, Hematoxylin and eosin stain)- Photomicorgraph showing total loss of villous capillaries and hyaline fibrosis of villous stroma.

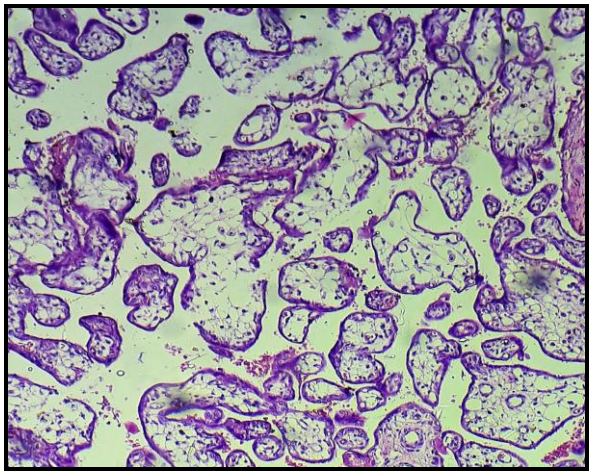

FIG.5-Villous Oedema (10X View, Hematoxylin and eosin stain) - Photomicorgraph showing enlargement of the chorionic villi with edema fluid, abundant stroma and histiocytic infiltrates.

Placental inflammatory immune processes-

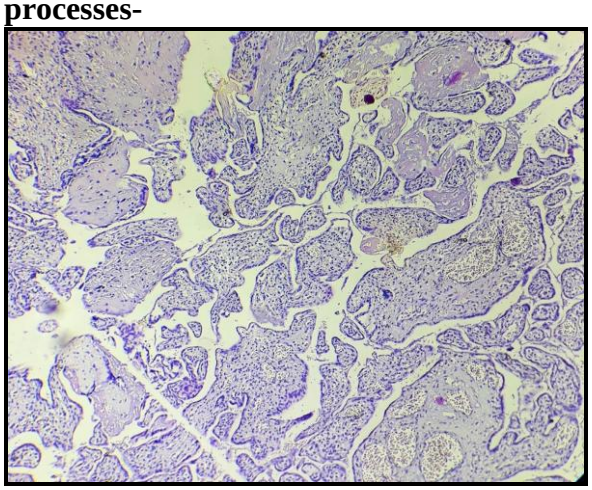

FIG.6-Chronic Villitis (10X View, Hematoxylin and eosin stain) – Photomicorgraph showing chorionic villi with inflammatory infiltrates of lymphocytes and few histiocytes.

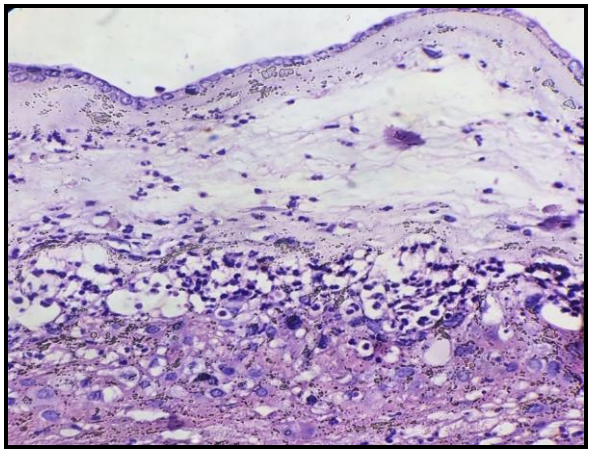

FIG.7-Acute Chorioamnionitis (40X View, Hematoxylin and eosin stain) – Photomicorgraph showing diffuse infiltrates comprised predominantly of polymorphs and few lymphocytes, plasma cells and few histiocytes in chorion and amniotic connective tissue.

OTHER PLACENTAL PROCESSES-

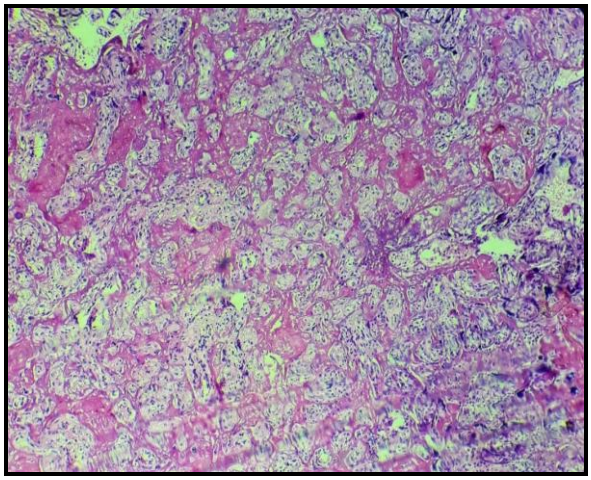

FIG.8-Massive perivillous fibrin deposition (10X View, Hematoxylin and eosin stain)- Photomicorgraph shows massive perivillous eosinophilic fibrin deposition with atrophic villi.

DISCUSSION

There is variability in definitions used in Placental Pathology Groupings in various studies of placentae. Many studies in literature have discussed placental lesions in subgroups. In this study we have discussed preterm placental pathology in accordance with classification by Redline et al and also studied for any association between placental pathology and neonatal outcomes by ascertaining these lesions in three main group's i.e. Placental vascular processes, Chorioamnionitis and No pathology. Neonatal outcome was studied in accordance with mean Gestational age at

birth, frequency of sepsis and requirement of resuscitation at birth.

A. Clinical characteristics-

Jamal et al[7] found frequency of late preterm births, moderate preterm births. Very preterm births similar to our study. Purisch SE et al[8] also mentioned more frequency of preterm birth after 34 weeks gestational age. Out of total live births, 10.2% babies were small for gestational age. CAKER U et al[9], Beaudet et al[10] and Levy et al[11] reported frequency of SGA as 13.7%, 18.9% and 8.8% respectively which is similar to our result. In present study out of 60 births, 65% (n=39) were live births and 35% (n=21) were stillbirths while Vinnars et al[12] reported 62.87% (n=105) live births out of 167 births while 37.12% (n=62) were stillbirths.

B. Placental characteristics-

Circular shape of placenta was most common as noticed in 60% cases which were comparable to Qureshi et al[13] who found 77% cases with circular shape and 23% with oval shape. Raghunath et al[14] also reported 94% cases of placentae with circular shape.

In the present study mean placental thickness was 2.65cm. It was found 1.612cm and 2.324cm in study by Zaidi MT[15] et al and Qureshi et al[13] respectively.

Table No.IV- Umbilical cord insertion-

	Naeye RL et al[16]	Qureshi et al[13]	Eastman et al[17]	Ashoka A et al[18]	Present study
Central	28%	7%	18%	32%	31.6%
Eccentric	56%	88%	73%	51%	61.6%
Marginal	15%	5%	7%	15%	6.6%
Velamentous	2%	0	1.25%	2%	0%

Eccentric insertion of the cord was the most common type in our study (61.6%).

Similarly Naeye RL et al[16], Qureshi et al[13], Eastman et al[17] and Ashoka A et al[18] also found eccentric insertion of umbilical cord as most common type of cord insertion.

Placenta microscopic examination-

i. Placental vascular processes-

We have divided our cases in main three groups. Total placental vascular processes were 73.3% out of total. CAKIR U et al[9] who were also divided study cases in main three groups, got 53.9% cases with placental vascular processes. Placental vascular lesions were most common lesions in our study as similar with CAKER U et al[9]. We again subdivided placental vascular processes in two main groups. Maternal stromal vascular lesions were noticed in 50% placentae and fetal stromal vascular lesions in 55% placentae. Total of two exceeds as more than one lesion was present in some placentae. After literature study we observed that data is lacking about more subdivided lesions in preterm births. Roescher et al[19] who got 60% placentae with maternal stromal vascular lesions. In literature there is deficiency of data about fetal stromal vascular lesions. We observed most of the studies discuss about fetal vascular malperfusion instead of main group fetal stromal vascular lesions. So, we divided fetal stromal vascular lesions in three groups. In that, 16.6% cases consisted of fetal vascular malperfusion. Roescher et al[19] reported 15% cases and Chisholm et al[20] reported 20% cases with fetal vascular malperfusion. Data is lacking about more subdivided lesions in placenta in preterm births.

ii. Placental immune inflammatory lesions-

We found 15% (n=9) cases with chorioamnionitis and 23.3% with placenta inflammatory immune lesions. Most of the studies discussed about frequency of chorioamnionitis rather than total placental inflammatory immune processes. CAKIR U et al[9] found 12.3% (n=35) placentae with chorioamnionitis. They did not specified about total inflammatory immune lesions. Vik T et al[21] found 7% (n=5) placentae with chorioamnionitis and 18% with Placental

inflammatory immune lesions. Anblagan D et al[22] reported 14.4% with chorioamnionitis.

According to Ocheke AN et al[23] frequency of histopathological chorioamnionitis may vary from 11.5 to 57.3%. Thus our result of chorioamnionitis is comparable with CAKIR et al, Anblagan D et al[22] and Ocheke AN et al[23] studies and findings of Placental Inflammatory Immune Processes (PIIP) are comparable with study by Vik T et al[21].

iii. Maternal floor infarction (MFI)/ Perivillous fibrin (oid) deposition-

Aggarwal R et al[24] (2016) found 6.6% with MFI out of 60 placentae while Beaudet et al[10] reported 11% of MFI out of 1296 placentae. In our study 10% of MFI out of 60 total cases.

C. Frequency of caesarean section and placental pathology-

Our study is comparable with Ogunyemi et al[25] and CAKIR U et al study regarding frequency of caesarean section being highest when placentae are affected by vasculopathy. We found 43.2% cases with vasculopathy had undergone caesarean section. CAKIR U et al[9] found 91.5% cases and Ogunyemi et al[25] found 57% cases with vasculopathy had undergone caesarian section.

In our study the delivery by caesarean sections were found to be lowest in the Chorioamnionsitis group as also reported in CAKIR U et al[9] (51.4%) and Ogunyemi et al[25] (43%).

D. Placental findings in stillbirths cases-

In placentae of stillbirth cases, vascular lesions were the most common findings (85.7%), second most common was inflammatory immune lesions (47.6%),then placentae with maternal floor infarction (19%) and 4.7% cases with placentae accrete.

Pinar et al[26] also found vascular lesions were the most common findings (61.1%),thereafter immune inflammatory lesion was the second most common (14.9%) maternal floor infarction in 9.2% cases.

The most common placental inflammatory lesion was acute chorioamnionitis in our study (19%) which was similar to Pinar et al[26] (30.4%) and Bukowski et al[27] study (24.5%).Chorionic vasculitis were present in 4.7% cases. Bukowski et al[27] found 3% cases with chorionic vasculitis. So our findings were comparable with Bukowski et al[27].

E. Comparison of placental findings with Neonatal parameters

Table-V-Comparison of placental findings with Neonatal parameters-

Placental pathology	Study	Mean GA(week)	Sepsis (%)	Resuscitation (%)
No pathology	CAKIR U et al[9]	32.5	8.3%	11.4%
	Present study	34.6	0%	20%
Placental vascular processes(n=26)	CAKIR U et al[9]	31.3	9.8%	22.8%
	Present study	31.8	19.2%	61.5%
Chorioamnionitis	CAKIR U et al[9]	28.5	82.8%	25.7%
	Anblagan D. et al[22]	-	62%	-
	Present study	30.8	66.6%	66.6%

Mean gestational age was highest in group without any pathology and lowest in group with placentae showing chorioamnionitis, and these findings were comparable with study by CAKIR U et al.

We found frequency of neonatal sepsis was highest in babies with accompanying placenta having chorioamnionitis (66.6%) similar finding was reported by CAKIR U et al.

CAKIR U et al found increased frequency of resuscitation requirement in babies with placentae having chorioamnionitis (25.7%) while In present study we also observed highest frequency of resuscitation in babies with placentae having chorioamnionitis (66.6%).Difference in frequency may be due to difference in sample size.

CONCLUSION

Among all preterm births, most preterm births occur in late preterm phase (34-36 weeks). Circular shape of placenta and eccentric insertion of umbilical cord was more common. Prominent microscopic pathology in placentae of preterm births was placental vascular processes, placental immune inflammatory lesions and maternal floor infarction. Placental vascular processes/ vasculopathy were the most frequent lesion (73.3%). Frequency of immune inflammatory lesions was 23.3% in placentae of preterm births. Chorioamnionitis was the most common inflammatory lesion. Frequency of chorioamnionitis (including infectious and immune cause) was 15%.

Frequency of caesarean section was highest when placentae are affected by vasculopathy lesions.

In stillborn preterm also, placental vascular processes were most frequently present. Among all inflammatory lesions, acute chorioamnionitis was the most common lesion in preterm stillbirths. Infants delivered by mothers with placental chorioamnionitis were found to be more preterm and have more risk of neonatal morbidities like sepsis in neonatal period.

Such placental lesions are easily detectable by histopathological examination and these placental findings can help neonatologist in routine diagnosis and management. However, there is a need of optimising the importance of placental examination among clinicians as well as it is also important to establish a routine protocol of placental examination accompanying neonatal care as followed in abroad countries. Studies on placental pathology and maternal morbidities are available. As compared, such data in view of neonatal morbidities is less. So, larger study on placental pathology in this view is also recommended.

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Conflict of Interest: None

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Ethical Approval: Approved

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