Maternal placental vasculopathy and infection in patients with preterm delivery

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Abstract

Background: Premature delivery remains the most important cause of neonatal mortality and there is considerable amount of information in the literature indicating a strong association between maternal placental vasculopathy and chorioamnionitis with preterm delivery.

Objective:.To outline the association between maternal placental vasculopathy and chorioamnionitis with preterm labor and premature rupture of membranes.

Patients & Methods: We performed a case control study conducted on 54 patients who were delivered preterm 37 patients because of preterm labor and 17 because of premature rupture of membranes, and 54 patients who were delivered at term after uncomplicated pregnancy for the period from January 2004 to July 2005. We studied the clinical information's obtained include demographic data, gestational age, obstetric history, route of delivery, infants birth weight and placental histopathological features. All the patients were seen at Gynecology &Obstetrics department at al kadhimyah teaching hospital in Baghdad.

Results: Maternal placental vascular lesions were present in 13 (35.1%) patients with preterm labor, and six (35.3%) patients, with premature rupture of membranes while only 6 (11.1) of control patients. Histopathological features suggestive of Infection of the placenta were found in 14 (37.8%) patients with preterm delivery and 6 (35.3%) patients with premature rupture of membranes and eight (14.8%) of control patients. ***Conclusion:*** It is possible to identify two subgroups of patients among those who are delivered preterm because of preterm labor or premature rupture of membrane, one with infection of the product of conception and another with maternal placental vasculopathy.

Keywords: premature rupture of membranes: placental disorders, decidaul vasculopathy, infection, preterm labor, premature membranes.

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Introduction

Preterm labor is the leading cause of perinatal morbidity and mortality all over the world. It usually results in preterm birth, a complication that affects 8 to 10 percent of births.

Strategies to prevent preterm delivery have focused on early diagnosis of preterm labor and on clinical markers such as cervical change, uterine contractions, bleeding and changes in fetal behavioral states.

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Diagnosing early preterm labor is difficult and has a high false-positive rate. False diagnoses of preterm labor have resulted in unnecessary and potentially hazardous treatment for thousands of women. Improved methods of early diagnosis would be a significant advance in the treatment of women at risk for preterm labor [(1)].

The development and wide spread use of tocolytic agents over the past 2 decades has not appeared to substantially affect the overall incidence of preterm delivery [(2)].

The human placenta is an under examined organ. The clinical indications for placental examination have no gold standards. The histopathological examination and diagnosis of the placenta may

crucial information.

It is possible to highlight treatable maternal conditions and identify placental or fetal conditions that can be recurrent or inherited Preterm delivery therefore remains one of the most poorly understood mechanisms of perinatal morbidity and mortality [3].

Not all patients with preterm labor or premature rupture of membranes have infection; therefore, conditions other than infection should have an important role in producing these problems. The purpose of this research is to study the contribution of placental pathology to the understanding of the structural and functional abnormalities that may precede the preterm delivery.

Patients &Methods

The patient's population was composed of 108 patients with singleton pregnancies. 37 were delivered preterm after spontaneous premature uterine contractions, 17 were delivered preterm after premature rupture of membranes. The gestational age of preterm group was between 24 and 34 weeks gestation, and 54 were delivered at term after uncomplicated pregnancies.

From January 2004 to July 2005, we studied the clinical information's obtained include demographic data, gestational age, obstetric history, route of delivery, infants birth weight and placental histopathological features. All patients were seen at gynecology & obstetrics department at Al Kadhimyah teaching hospital, in Baghdad.

Delivered placentas were placed in clean plastic bag, taken to the laboratory where processing and histologic studies performed. The placentas of all deliveries were processed and interpreted by senior consultant pathologist according to standardized protocol [4,5,6, and 7].

Histopathological Examination of Placenta

Each placenta was studied grossly on a clean surface, and then histopatholgical examination of the placenta including a piece from membranes stripped, portion of umbilical cord, and several blocks of the placenta were dissected from maternal side.

Histological chorioamnionitis was characterized by the presence of polymorphonuclear leukocytes with or without associated necrosis in the fetal membranes and subchorionic fibrin plate. The degree of severity was graded subjectively into three grading system based on the number and the extent of infiltration of neutrophils (figure 1).

Maternal placental vasculopathy was diagnosed when segment of spiral arteries attached to maternal surface of the placenta failed to show the presence of adaptive changes and remained as small muscular vessels with well defined wall, containing recent or old organized thrombi, (figure 2), additional histopathological criteria were the presence of uneven accelerated abnormally small fibrotic chorionic villi with abnormally thin syncytiotrophoblastic knots, and multiple placental infarcts (figure 3).

Statistical analysis

The significance of differences observed between control group and preterm labor and premature rupture of membranes groups were determined with student t test.

Results

The descriptive variables for patients in the three groups (preterm labor, premature rupture of membranes, control) are shown in table 1.As expected there were significant differences between control group and study groups (premature labor and premature rupture of membranes) with respect to gestational age at time of delivery and birth weight. The incidence of primigravid patients in the three groups was not statistically different (Table 1).

Table 2 shows the classification of

patients in to five groups: infection, maternal placental vasculopathy, mixed lesion, abruption placentae, and normal findings. The prevalence of infection and maternal placental vasculopathy was significantly higher in patients with preterm labor than control women who were delivered at term (P<0.05).

Abruptio placentae occurred significantly more frequently in patients with preterm labor than in control(Table 2).

Table 3 shows the classification of patients with premature of membranes in to five different groups according to histopathological examination. The prevalence of infection and maternal placental vasculopathy was significantly higher in patients with premature rupture of membranes than in control women who were delivered at term. (Table 3)

The number of patients with normal findings was significantly larger in the control group than in the preterm labor or premature rupture of membranes (P<0.05).

Of the six patients with premature rupture of membranes classified as having infection four had grade III chorioamnionitis.Sever histologic amnionitis (grade III) was significantly more frequent in patients with premature rupture of membranes and preterm labor than in the control group (Table 4).

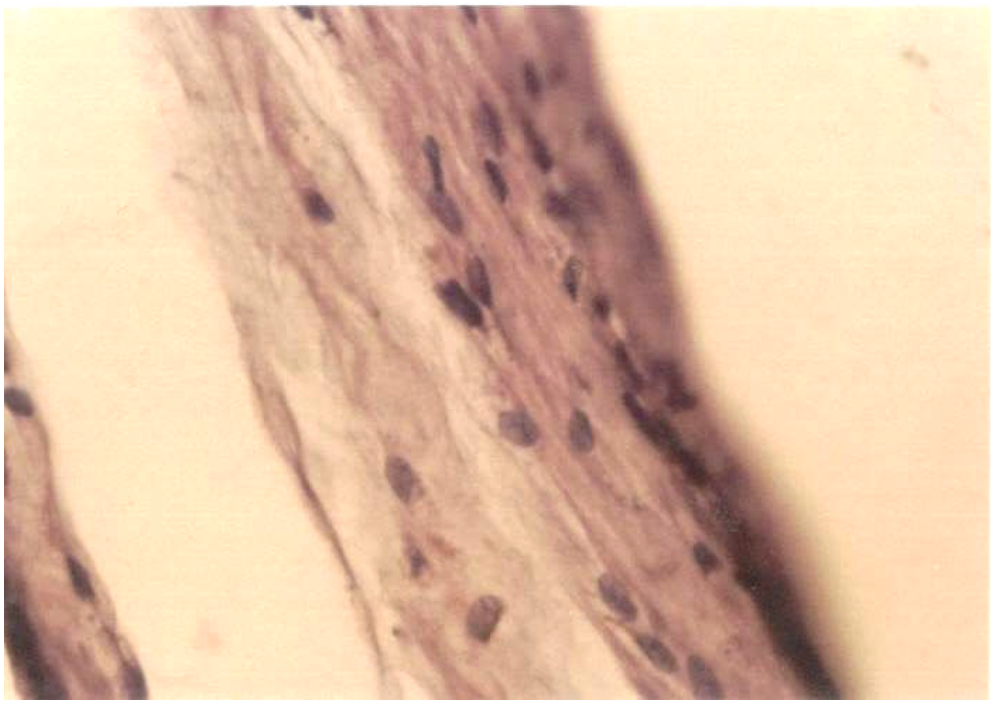

Figure 1: mild degree of chorioamnionitis with acute inflammtory cells appearing as dark blue spots. H&E(X 400).

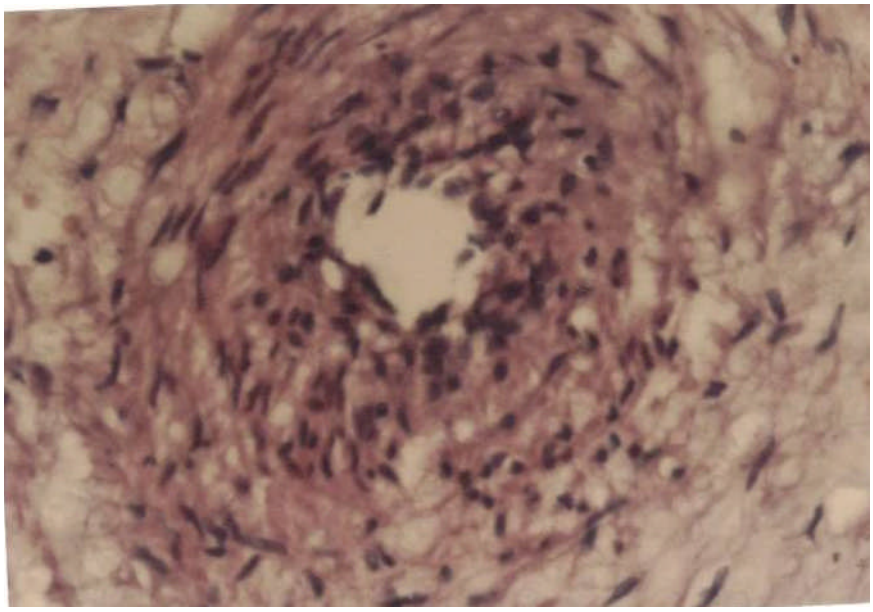

Figure 2: Features of maternal placental vasculopathy. H&E. (X400).

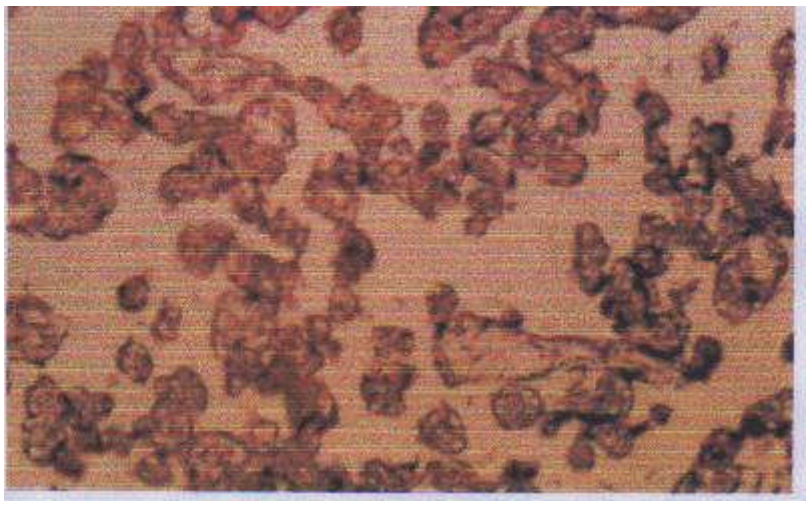

Figure 3: Small and even abnormal fibrotic chorionic villi

Table 1:Characteristics of patients

characteristics	Preterm labor(no.=37)(mean ±SE)	significance	Control(no.54) (mean±SE)	Significance	*PROM(no.=17) (mean±SE)
Maternal Age	24±6	NS	25±5.2	NS	26±5
Gravidity	3±1.4	NS	3.3±1.3	NS	32±1.5
parity	0.6±0.9	NS	0.9±1.1	NS	0.9±1.0
Gestational age(wk)	31.4±3.3	P<0.05	39.0±1.2	P<0.05	31.8±3.0
Cesarean delivery	6(16.2)	NS	8(14.8%)	NS	3(17.6%)
Birth weight	1760±330	P<0.05	3352±450	P<0.05	1795±321

NS= non significance
P= P value
*Premature rupture of membranes

Table 2:Classification of patients with preterm labor according to placental histopathology

Findings	Preterm labor (no. 37)	Control (no.54)	Significance
Infection	14(37.8%)	8(14.8%)	P<0.05
Maternal placental vascular lesion	13(35.1%)	6(11.1%)	P<0.05
Mixed lesion	3(8.1%)	2(3.7%)	NS
Abruptio placentae	3(8.1%)	0(0%)	P<0.05
Negative findings	4(10.8%)	38(70.3%)	P<0.05

NS= non significance
P= P value

Table 3: classification of patients with premature rupture of membranes (PROM) according to placental histopathology.

Findings	PROM (no.17)	Control (no.54)	Significance
Chorioamnionitis	6(35.3%)	8(14.8%)	P<0.05
Maternal placental vascular lesion	6(35.3%)	6(11.1%)	P<0.05
Mixed lesion	1(5.9%)	2(3.7%)	NS
Abruptio placentae	1(5.9%)	0(0%)	NS
Negative findings	2(11.8%)	38(70.3%)	P<0.05

NS= non significance
P= P value

Table 4: severity of histologic amnionitis

Grade	Preterm labor(no.=14)	Significance	Control(no.=8)	Significance	PROM(no.=6)
I	2(14.3%)	P<0.05	6(75%)	P<0.05	1(16.6%)
II	3(21.4%)	NS	2(25%)	NS	1(16.6%)
III	9(64.3%)	P<0.05	0(0%)	P<0.05	4(66.6%)

NS= non significance
P= P value

Discussion

Our data suggest the presence of two well defined subgroups among patients with preterm labor and premature rupture of membranes one of them is characterized by the presence of infection of the product of conception and the other by the presence of maternal placental vascular abnormalities consisting of lack of adaptive changes in the decidual portion of the spiral arterioles and the presence of uneven accelerated maturation of the villi, multiple syncitial knots and placental infarcts.

Placental inflammation is a common finding in preterm gestations. It is most often not associated with clinical evidence of infection, so the diagnosis is usually made at the time of histologic placental examination. Silent chorioamnionitis is a significant cause of "uncomplicated" preterm labor refractory to conventional methods of tocolysis [8]

The finding of an association between chorioamnionitis and premature labor and PROM is not surprising and has been clearly and widely studied by many authors [5,9,10,11,12,13,14]. Our study showed that histopathological evidence of infection was found in 37.8 % of cases of preterm labor and 35.3% of patients with premature rupture of membranes, which is similar to that found by Fernando Arias [15].

This association is found so frequently that the possibility of a cause effect relationship between infection and preterm labor and PROM is widely accepted among experts in this field. [14, 16, 17, 18] ,which proved in our study.

Less popular is the idea of an association between maternal placental vasculopathy and preterm labor and premature rupture of membranes. The changes in maternal vascular compartment of the placenta in patients with preterm labor and premature rupture of membranes are similar to those found in patients with preeclampsia, in those with fetal growth retardation and in some patients with repetitive second- trimester fetal death. [19].

Maternal placental vasculopathy was found in 35.1% of patients with preterm labor and 35.3% of patients with premature rupture of membranes, which is similar to that found by fernando arias [15].

Ultimately a logarithms that combine sociodemographic factors, clinical and ultrasonographic findings, biochemical markers and a reasonable understanding of the pathophysiology of the mechanisms of preterm labor will be required if any progress is to be made in improving the rate of preterm delivery and consequent perinatal morbidity and mortality.

Until the pathophysiology of prematurity is, better understood effective methods of prevention or appropriate intervention will continue to elude clincians.In cases of vascular

complications, diagnostic and therapeutic research should be directed at subclinical manifestations of the underlying pathologic mechanism to prevent reaching a critical threshold at which labor is initiated. Care must continue to be taken however not to prolong pregnancies in which the uterine environment is no longer able to support the appropriate growth and/or survival of the fetus.

It was estimated that at least of 1/4th of preterm deliveries in the present study and others were associated with chorioamnionitis and maternal placental vascular changes, occurring either alone or with PROM, I recommended for further studies in that field including studying different lines of microbiological, immunological and further pathological studies.

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