Randomized placental and cord blood sampling culture in women with preterm and term labour to detect infection

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زرع عينة عشوائية من أنسجة المشيمة ودم السرر (الحبل السري) من نساء وضعن قبل الأوان، أو عند تمام الحمل لكشف العدوى

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خلاصة: في هذه الدراسة المستقبلية العشوائية، تم فحص عينات من أنسجة المشيمة ودم السرر، أخذت من نساء وضعن قبل أو عند تمام الحمل، بحثاً عما بها من كائنات دقيقة، وأجريت مقارنة فيما بينها. وتكونت العينة من مئة امرأة وضعن خلال فترة امتدت اثني عشر شهراً، وكان نصفهن ممن وضعن قبل إتمام مدة الحمل والنصف الآخر من ذوات الوضع عند تمام الحمل. وأخذت العينات في ظروف معقمة للزرع الروتيني للجراثيم الهوائية واللاهوائية، وذلك بعد خروج المشيمة مباشرة. وقد وجد أن مزارع الدم الجنيني كانت إيجابية في 30% من مجموعة الولادات التي وقعت قبل إتمام مدة الحمل وفي 18% من مجموعة الولادات التي أتمت مدة الحمل وتلك نتيجة يعتد بها إحصائياً. أما مزارع المشيمة فكانت إيجابية في 58% من حالات الولادات التي وقعت قبل إتمام مدة الحمل وفي 28% من حالات الولادات المكتملة الحمل. إن هذه المعطيات تعزز التقارير التي سبق نشرها، ومؤداها أن العدوى تلعب دوراً جوهرياً في إحداث الولادة قبل اكتمال مدة الحمل.

ABSTRACT Placental tissue and cord blood from women with preterm and term labour were examined for microorganisms and compared in this randomized prospective study. Of 100 women who delivered during a 12-month period, 50 had preterm labour and 50 had term labour. Samples were taken under sterile conditions for routine culture of anaerobic and aerobic bacteria immediately after delivery of the placenta. Fetal blood cultures were positive for 30% of the preterm group and 18% of the term group, which was statistically significant. Placental tissue cultures were positive for 58% of the preterm group and 28% of the term group. These data support previous reports that infection plays a significant role in preterm labour.

Culture de prélèvements aléatoires de sang cordonal et de placenta chez des femmes ayant un accouchement avant terme et à terme pour détecter l'infection

RESUME Des tissus placentaires et du sang cordonal prélevés sur des femmes ayant un accouchement avant terme et à terme ont été examinés à la recherche de micro-organismes et comparés dans cette étude prospective aléatoire. Sur 100 femmes qui ont accouché pendant une période de 12 mois, 50 ont eu un accouchement avant terme et 50 à terme. Les prélèvements ont été réalisés dans des conditions stériles pour culture systématique des bactéries anaérobies et aérobies immédiatement après la délivrance du placenta. Les cultures de sang foetal étaient positives pour 30% du groupe des accouchements avant terme et pour 18% du groupe des accouchements à terme ce qui était statistiquement significatif. Les cultures de tissus placentaires étaient positives pour 58% du groupe des accouchements avant terme et pour 28% du groupe des accouchements à terme. Ces données viennent appuyer les rapports précédents montrant que l'infection joue un rôle important dans les accouchements avant terme.

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Introduction

The incidence of preterm labour has remained stable over the past decade. Currently, 10%–15% of deliveries occur before 37 weeks gestation despite aggressive treatment for preterm labour. Preterm rupture of the membrane accounts for approximately two-thirds of premature deliveries; the remainder can be attributed to delivery for maternal and fetal indications [*1*], which are responsible for a significant proportion of prenatal mortality [*2*]. Over the past decade, several investigators have attempted to determine the risk of preterm deliveries. Because of advances in prenatal care, there have been both improvements in neonatal outcome and a decrease in morbidity in premature infants [*3,4*].

The aim of this study was to access the incidence of infection in placental and cord blood samples in women with preterm labour.

Materials and methods

During a 12-month period (March 1996 to March 1997), placental tissue and cord blood samples from 100 women were cultured anaerobically and aerobically under sterile conditions. The 100 women who delivered and were enrolled in the study were randomly selected; 50 had preterm and 50 had term deliveries. Preterm labour was defined as regular uterine contractions associated with cervical dilation > 2 cm. The mothers included in the preterm group had a gestational age between 28 weeks and 37 weeks; those in the control group with term labour had completed more than 37 weeks. Intact fetal membranes were required for inclusion in the study.

All the women enrolled in the study had continuous electronic fetal heart monitoring and monitoring of maternal vital signs during labour. Antiseptic measures were carried out and vaginal examination was made every 3 hours. In addition to ultrasonographic examination, all the women had the following laboratory tests: haematocrit, white blood cell count, C-reactive protein, urinalysis and electrolytes analysis. Drugs to inhibit uterine contractions, antibiotics and corticosteroids to stimulate fetal lung maturity were not used.

Statistical significance was determined at a P-value < 0.05.

Results

Clinical characteristics of the women enrolled in the study are given in Table 1.

Table 2 lists the microorganisms cultured from cord blood and placental tissue from the two study groups.

Cultures from placental tissue were positive in 29 cases (58%) of the preterm group and in 15 cases (30%) of the term group. The difference was statistically significant ($\chi^2 = 6.86$, $P < 0.01$) (odds ratio = 3.32, 95% confidence interval 1.13–8.83). Cultures from cord blood were positive in 14 cases (28%) of the preterm group and in 9 cases (18%) of the term group. The difference was not statistically significant ($\chi^2 = 1.41$, $P > 0.05$).

Table 1 Clinical characteristics of the women with preterm and term labour

Characteristic	Preterm	Term
No. of pregnancies	50 (100%)	50 (100%)
Maternal age (years) (mean ± s_x)	24.2 ± 0.6	26.2 ± 0.5
Multiparous	35 (70%)	38 (76%)
Prior preterm birth	8 (16%)	7 (14%)

None of the differences was statistically significant
s_x = standard error of the mean

Table 2 **Microorganisms cultured from cord blood and placental tissue**

Microorganism	Preterm (n = 50)				Term (n = 50)			
	Cord blood		Placental tissue		Cord blood		Placental tissue	
	No.	%	No.	%	No.	%	No.	%
None	36	72	21	42	41	82	35	70
Escherichia coli	3	6	10	20	2	4	5	10
Klebsiella	1	2	2	4	1	2	2	4
Proteus	0	0	1	2	0	0	0	0
Staphylococcus epidermis	1	2	2	4	1	2	1	2
S. aureus	1	2	1	2	0	0	0	0
Streptococcus milleri	1	2	2	4	0	0	1	2
Strep. viridans	1	2	0	0	0	0	0	0
Strep. sanguis	1	2	1	2	1	2	1	2
Strep. agalactiae	1	2	4	8	1	2	2	4
Citrobacter	1	2	0	0	0	0	0	0
Lactobacillus	0	0	1	2	1	2	1	2
Peptostreptococcus	1	2	2	4	1	2	1	2
Enterobacter	1	2	2	4	1	2	1	2
Mixed growth	1	2	1	2	0	0	0	0
Total	14	28	29	58	9	18	15	30

Enterobacter microorganisms, i.e. *Escherichia coli*, *Klebsiella* spp. and *Proteus* spp., were found more frequently among the preterm group in both cord blood and placental tissue cultures. *Staphylococcus epidermis* and *S. aureus* were also more prevalent in the preterm group as were streptococcal bacteria (*Streptococcus milleri*, *Strep. viridans*, *Strep. sanguis* and *Strep. agalactiae*). *Citrobacter* species was positive in one case of cord blood from the preterm group, and mixed anaerobes were found in one case (Table 2).

Fetal bacteraemia was found in 48% (14 of 29 cases) of the preterm group with positive placental sampling culture and in 60% of the term group (9 of 15 cases) with positive placental sampling culture.

Discussion

The exact relationship between bacterial infection and the genesis of preterm birth is not known, but there is evidence that about one-third of preterm deliveries are associated with occult infection of the chorioamniotic membrane [5].

There is increasing information to suggest intrauterine infection is a major cause of preterm labour. Infection may promote preterm labour by producing prostaglandins that in turn stimulate labour. Romero et al. noted that prostaglandin production by human amnion can be stimulated by bacterial endotoxins and that many organisms produce phospholipase A_2 and thus may potentially initiate preterm labour [6].

Cox et al. reported findings that were consistent with the view that bacterial endotoxins (lipopolysaccharides) in amniotic fluid stimulate decidual cells to produce cytokines and prostaglandins that may initiate labour [7].

Umbilical chorionic infection indicates ascending bacterial infection and is present in up to 40% of placental pathological findings in preterm labour.

Possible mechanisms for the entry of bacteria into fetal circulation include transfer across the fetal lung after aspiration of amniotic fluid or transplacental migration from the decidual basalis into the chorionic villi.

We found that infection was more prevalent in both the placental and cord blood culture samples of preterm women than of women who went to term. Our results concur with studies, which have found that microorganisms play a significant role in preterm labour.

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