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Prediction of preterm delivery in twins by cervical assessment at 23 weeks

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ABSTRACT

Objective *To establish the relation between cervical length at 23 weeks of gestation in twin pregnancies and risk of spontaneous delivery before 33 weeks.*

Methods *Cervical length was measured by transvaginal sonography at 23 (range 22–24) weeks of gestation in 464 twin pregnancies attending for routine antenatal care. In the patients who were managed expectantly the relation between cervical length and the rate of spontaneous delivery before 33 weeks was determined.*

Results *The cervical length distribution was skewed to the left and the median value was 36 mm. The rate of spontaneous delivery before 33 weeks was inversely related to cervical length at 23 weeks. It increased gradually from about 2.5% at 60 mm, to 5% at 40 mm and 12% at 25 mm, and exponentially below this length to 17% at 20 mm and 80% at 8 mm. Cervical length of 20 mm or less is found in about 8% of the population and this group contained about 40% of women delivering spontaneously before 33 weeks.*

Conclusions *In twin pregnancies measurement of cervical length provides useful prediction of risk for spontaneous early preterm delivery.*

INTRODUCTION

Delivery before 33 weeks of gestation is associated with a high risk of fetal death or severe handicap in survivors[1–4]. In singleton pregnancies, the rate of spontaneous delivery before 33 weeks is 1–2% and the risk of such an early delivery can be predicted from the measurement of cervical length at 23 weeks of gestation[5,6]. The estimated risk increases exponentially with decreasing cervical length from about 0.2% at 60 mm to 0.8% at 30 mm, 4.0% at 15 mm and 78% at 5 mm[6].

In twin pregnancies the rate of preterm delivery before 33 weeks is 5–10%[7] and recent evidence suggests that measurement of cervical length at 23 weeks of gestation provides useful prediction of early preterm delivery[8–10]. In a study of 215 twin pregnancies examined at 23 weeks we estimated that the risk for early preterm delivery increases exponentially with decreasing cervical length from about 2% at 55 mm, to 4% at 40 mm, 30% at 20 mm and 70% at 10 mm[10]. The aim of this extended study of 464 twin pregnancies was to examine further the possible value of cervical assessment at 23 weeks in the prediction of risk for spontaneous early preterm delivery.

SUBJECTS AND METHODS

Transvaginal sonographic measurement of cervical length was offered to women with twin pregnancies attending our unit for the 23-week fetal anatomy and growth scan. In all cases the chorionicity had been determined by examination of the interfetal membranes at the 10–14-week scan[11]. The study was approved by the hospital ethics committee.

The women were asked to empty their bladder and were placed in the dorsal lithotomy position. Transvaginal sonography with a 5-MHz transducer (Aloka 1700, Aloka Co. Ltd, Tokyo, Japan) was carried out by appropriately trained sonographers. The probe was placed in the anterior fornix of the vagina and a sagittal view of the cervix, with the echolucent endocervical mucosa along the length of the canal, was obtained. Care was taken to avoid exerting undue pressure on the cervix. The calipers were used to measure the distance between the triangular area of echolucency at the external os and the V-shaped notch at the internal os[12–13]. Each examination was performed during a period of about three minutes to observe any cervical changes; such changes that may be due to contractions are observed in less than 1% of patients and in such cases the shortest measurement was recorded.

Patient characteristics, including demographic data and previous obstetric and medical history, were obtained from the patients at their first visit to the hospital and were entered into a computer database. Similarly, the ultrasound findings were recorded in the database at the time of the scan. Gestational

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age was determined from the menstrual history and confirmed from the measurement of fetal crown–rump length of the longer twin at the first-trimester scan[14]. Data on pregnancy outcome were obtained from the computerized system in the delivery ward, and in those who delivered in other hospitals, from either the patients themselves or their general medical practitioners.

Statistical analysis

The normality of the distribution of cervical length was examined by the Kolmogorov-Smirnov test. Chi-square or Fisher's exact tests were used to calculate the significance of differences in the percentage of spontaneous delivery before 33 weeks between subgroups according to demographic characteristics, previous obstetric history and chorionicity. The rate of spontaneous delivery before 33 weeks according to cervical length and the sensitivity and false positive rates for cut-off cervical length of 15, 20 and 25 mm were calculated.

RESULTS

The computer search identified 470 twin pregnancies with live fetuses that had cervical assessment at 22–24 (median 23) weeks of gestation. Pregnancy outcome data were obtained from 464 patients and the six with no follow up were excluded from further analysis. The 464 cases included 313 (67.5%) dichorionic and 151 (32.5%) monochorionic pregnancies. There were 378 (81.5%) Caucasians, 71 (15.3%) of Afro-Caribbean origin and 15 (3.2%) of other ethnic groups; 203 (43.8%) were aged 35 years or more and 44 (10.1%) were cigarette smokers. In terms of obstetric history, 146 (31.5%) patients had had no previous pregnancies, 100 (21.6%) had only had one or more miscarriages and/or terminations of pregnancy before 16 weeks of gestation, 181 (39.0%) had had one or more term deliveries, with or without previous fetal losses before 16 weeks, 26 (5.6%) had had at least one previous spontaneous preterm delivery, and 11 (2.4%) had had at least one previous miscarriage or termination at 16–23 weeks.

The distribution of cervical length was skewed to the left. The median, fifth and first centiles were 36 mm, 16 mm, and 7 mm, respectively, the mean was 35.5 mm and the SD was 10.1 mm (Figure 1). In 21 (4.5%), 37 (8.0%) and 60 (12.9%) of cases the cervical length was up to 15 mm, 20 mm and 25 mm, respectively. The median cervical length was the same in dichorionic and monochorionic twins.

In 17 patients iatrogenic delivery before 33 weeks was carried out and these were excluded from further analysis. In 13 patients with short cervical lengths (0–19 mm) a cervical suture was placed; four delivered before 33 weeks (25–28 weeks) and nine after 34 weeks. All other patients were managed expectantly without bed rest or prophylactic antibiotics or tocolytics. In this group of 434 patients the spontaneous delivery rate before 33 weeks was 7.8% (8.1% for dichorionic twins and 7.2% for monochorionic twins). There was a significant inverse association between cervical length and percentage risk of preterm delivery before 33 weeks (Figure 2; risk = $26.48 \times \text{cervical length}^{-1.688}$; $r^2 = 0.935$, $P < 0.0001$). This formula was used to estimate the number of spontaneous early preterm deliveries in the 13 patients who had placement of a cervical suture (seven rather than the observed four) and these patients were included in the calculation of sensitivity and false positive rate for preterm delivery according to different cut-offs of cervical length (Table 1). The rate of spontaneous preterm delivery before 33 weeks was not related significantly to any of the demographic characteristics, previous obstetric history, or chorionicity (Table 2).

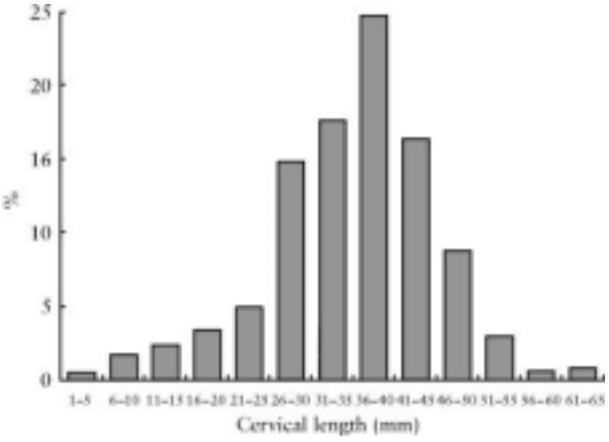

Figure 1 Distribution of cervical length at 23 weeks of gestation in 464 twin pregnancies.

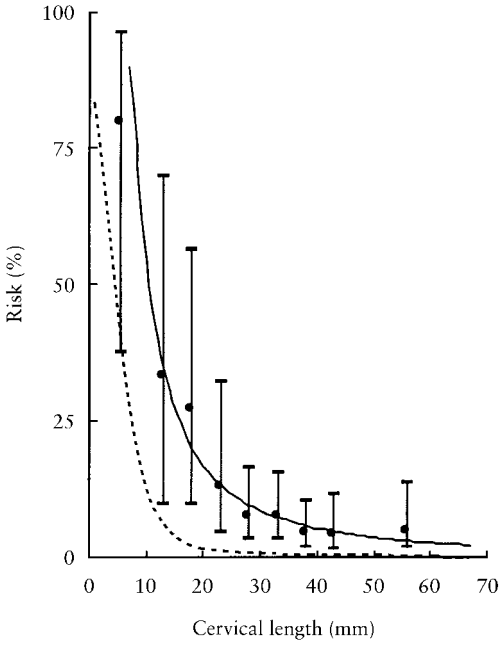

Figure 2 Rate of spontaneous delivery before 33 weeks and 95% confidence intervals according to cervical length at 23 weeks of gestation in twin pregnancies from this study (solid line) and in singleton pregnancies (broken line)[7].

DISCUSSION

This study has demonstrated that in twin pregnancies the risk of spontaneous preterm delivery before 33 weeks can be

predicted from measurement of cervical length at 23 weeks of gestation. The risk increases gradually from about 2.5% at 60 mm to 12% at 25 mm and exponentially below this length to 17% at 20 mm and 80% at 8 mm. The study has also confirmed that measurement of cervical length provides sensitive prediction of spontaneous early preterm delivery. Thus, cervical length of 20 mm or less is found in about 8% of the population and this group contains about 40% of women delivering spontaneously before 33 weeks.

The median cervical length in twins is similar to that in singleton pregnancies but a higher proportion of twins have a cervical length of 25 mm or less (12.9% in twins compared with 8.4% in singletons) and 15 mm or less (4.5% in twins compared with 1.5% in singletons)[15]. This is not surprising because the rate of early preterm delivery in twins is much higher than in singletons. Thus, spontaneous delivery before 33 weeks is about 8% in twins compared to 1.5% in singletons. In singleton pregnancies the exponential increase in risk for early preterm delivery is observed in patients with cervical length below 15 mm[6], whereas in twins this threshold is 25 mm. In twins a longer cervix may be needed to maintain its physiological role as an effective barrier to early preterm delivery, because prelabor uterine activity in twin pregnancies is significantly higher than in singletons from at least as early as 23 weeks of gestation[16–18].

In singleton pregnancies the rate of preterm delivery is increased in women of Afro-Caribbean origin, teenagers, those with low body mass index and cigarette smokers and in those who have had previous late miscarriages or preterm deliveries[6]. The absence of significant associations in twins is likely to be a consequence of the small number of cases examined rather than an underlying physiological difference in the mechanism of preterm delivery. The incidence of early preterm delivery is twice as high in monochorionic compared to dichorionic twins[19]. However, this difference is almost entirely due to polyhydramnios of severe twin-to-twin transfusion syndrome

Table 1 False positive rate and sensitivity for spontaneous delivery before 33 weeks according to cervical length cut-offs

Cervical length	n	*False positive rate (%)*	*Sensitivity (%)*
≤ 15 mm	11	5 of 400 (1.3)	6 of 34 (17.6)
	[21]	[8.6 of 406 (2.1)]	[12.4 of 41 (30.2)]
≤ 20 mm	22	13 of 400 (3.3)	9 of 34 (26.5)
	[35]	[19 of 406 (4.7)]	[16 of 41 (39.1)]
≤ 25 mm	45	33 of 400 (8.3)	12 of 34 (35.3)
	[58]	[39 of 406 (9.6)]	[19 of 41 (46.4)]

Values in square brackets include the 13 patients treated with cervical cerclage.

Table 2 Association between spontaneous delivery before 33 weeks of gestation and patient characteristics, previous obstetric history and cervical length in 434 twin pregnancies that were managed expectantly

	Total		*Delivery < 33 weeks*		
	n	%	n	%	*Comparison of subgroups*
Ethnic group					
1. Caucasian	354	81.6	30	8.5	1 vs. 2 $\chi^2 = 0.754$ $P = 0.39$
2. Afro-Caribbean	67	15.4	3	4.5	1 vs. 3 $P > 0.99$
3. Other	13	3.0	1	7.7	2 vs. 3 $P = 0.52$
Age (years)					
1. < 35	242	55.8	24	9.9	
2. ≥ 35	192	44.2	10	5.2	1 vs. 2 $\chi^2 = 2.668$ $P = 0.10$
Ponderal index*					
1. < 19.8	33	7.9	3	9.1	1 vs. 2 $P = 0.73$
2. 19.8–26	270	64.7	21	7.8	1 vs. 3 $P = 0.71$
3. > 26	114	27.3	8	7.0	2 vs. 3 $\chi^2 = 0.002$ $P = 0.96$
Cigarette					
1. Smoker	14	3.2	1	7.1	
2. Non-smoker	420	96.8	33	7.9	1 vs. 2 $P > 0.99$
Obstetric history					
1. Primigravidae	131	30.2	11	8.4	
2. Multigravidae	303	69.8	23	7.6	1 vs. 2 $\chi^2 = 0.009$ $P = 0.93$
3. Delivery at ≥ 37 weeks	176	40.6	10	5.7	1 vs. 3 $\chi^2 = 0.495$ $P = 0.48$
4. Fetal loss at < 16 weeks	92	21.2	8	8.7	1 vs. 4 $\chi^2 = 0.006$ $P = 0.94$
5. Fetal loss at 16–23 weeks	9	2.1	1	11.1	1 vs. 5 $P = 0.56$
6. Delivery at 32–36 weeks	21	4.9	2	9.5	1 vs. 6 $P > 0.99$
7. Delivery at 24–31 weeks	5	1.2	2	40.0	1 vs. 7 $P = 0.07$
Chorionicity					
1. Monochorionic	139	32.0	10	7.2	
2. Dichorionic	295	68.0	24	8.1	1 vs. 2 $\chi^2 = 0.022$ $P = 0.88$

*The ponderal index was not measured in 17 cases.

that complicates about 15% of monochorionic twin pregnancies. In this study we excluded severe twin-to-twin transfusion syndrome and found that monochorionic and dichorionic twin pregnancies are similar in both cervical length at 23 weeks and in incidence of spontaneous early preterm delivery.

In this study cervical length was measured on one occasion at 23 weeks because this is considered to be the latest possible gestation for safely inserting an elective cervical suture. Certainly in singleton pregnancies with short cervices at 23 weeks the placement of a suture may be associated with a significant reduction in risk for early preterm delivery[20]. The extent to which the same may be true for twin pregnancies remains to be determined in an ongoing randomized study.

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