Sonographic measurement of cervical length in twin pregnancies in threatened preterm labor

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ABSTRACT

Objective *To determine whether sonographic measurement of cervical length in twin pregnancies presenting with threatened preterm labor helps distinguish between true and false labor.*

Methods *In 87 women with twin pregnancies presenting with regular and painful uterine contractions at 24–36 (median, 30) weeks of gestation, cervical length was measured by transvaginal ultrasound. Women presenting in active labor, defined by the presence of cervical dilation of 3 cm or more, with ruptured membranes and those who underwent a prior or subsequent cervical cerclage, were excluded from the study. The clinical management was determined by the attending obstetrician without taking into account the cervical length. Primary outcome of the study was delivery within 7 days of presentation.*

Results *Delivery within 7 days of presentation occurred in 19/87 (22%) pregnancies and this was inversely related to cervical length, decreasing from 80% (4/5) at 1–5 mm, to 46% (6/13) at 6–10 mm, 29% (4/14) at 11–15 mm, 21% (4/19) at 16–20 mm, 7% (1/15) at 21–25 mm and 0% (0/21) at > 25 mm. Logistic regression analysis demonstrated that significant independent contribution in the prediction of delivery within 7 days was provided by cervical length (odds ratio (OR) = 0.78, 95% CI 0.68–0.89, P < 0.001) and use of tocolytics (OR = 0.13, 95% CI 0.02–0.76, P = 0.024), with no significant contribution from gestation at presentation, chorionicity, ethnic origin, maternal age, body mass index, parity, previous history of preterm delivery, cigarette smoking, contraction frequency, vaginal bleeding or the administration of antibiotics or steroids.*

Conclusion *In women with twin pregnancies presenting with threatened preterm labor, sonographic measurement of cervical length helps distinguish between those who deliver within 7 days and those who do not. Copyright © 2004 ISUOG. Published by John Wiley & Sons, Ltd.*

INTRODUCTION

Preterm delivery is the leading cause of neonatal mortality and morbidity and the incidence in twin pregnancies is five to ten times higher than in singletons. About 80% of women presenting in threatened preterm labor are not in true labor and do not deliver within 7 days of presentation[1,2]. However, our ability to clinically distinguish between true and false preterm labor is poor, and consequently the majority of patients presenting in threatened preterm labor are treated by hospitalization and the administration of tocolytics and steroids. In singleton pregnancies with threatened preterm labor, sonographic measurement of cervical length helps distinguish between true and false labor. Thus, in a study of 216 singleton pregnancies presenting in threatened preterm labor, delivery within 7 days occurred in about 40% of those with cervical length of 0–14 mm and in less than 1% of those with cervical length of 15 mm or more[3].

The aim of this study was to examine whether sonographic measurement of cervical length in twin pregnancies presenting with painful contractions helps distinguish between those women who deliver within 7 days and those who do not.

METHODS

This was a prospective observational study of sonographic measurement of cervical length in women with twin pregnancies presenting to the labor ward with painful and regular uterine contractions at 24–36 weeks of gestation. In all cases gestation was calculated from the menstrual history and by an ultrasound scan in early pregnancy, which also determined chorionicity[4]. Women in active labor, defined by the presence of cervical dilatation of 3 cm or more, those with ruptured membranes and those with cervical cerclage, were excluded. The study was undertaken in five centers (Virchow Clinic Charité, Berlin, Germany; Harold Wood, King George's and St John's

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Hospitals, Essex and St Mary's Hospital, Portsmouth, UK) between August 2000 and March 2003.

Transvaginal sonography was carried out by appropriately trained doctors using a 5- or 7-MHz transducer. A sagittal view of the cervix, with the echogenic endocervical mucosa along the length of the canal, was obtained and the calipers of the machine were used to measure the distance of the cervical canal between the furthest points at which the cervical walls were juxtaposed[5,6]. Three measurements were obtained and the shortest, technically best measurement in the absence of uterine contractions was recorded.

The management of the women, including hospitalization and administration of tocolytics and steroids, was determined by the attending obstetricians. The ultrasound findings did not influence the management of the women. The primary outcome measure was delivery within 7 days of presentation.

Statistical analysis

Logistic regression analysis was used to investigate the effect of maternal age, ethnic origin (Caucasian, non-Caucasian), parity (multiparous, parous), gestation at presentation, cigarette smoking (yes or no), body mass index (BMI), chorionicity (dichorionic, monochorionic), frequency of uterine contractions (one, two or three contractions per 10 min), bleeding at presentation (yes or no), use of tocolytics (yes or no), antibiotics (yes or no) or steroids (yes or no) and cervical length on delivery within 7 days of presentation. Two-tailed *P*-values are reported throughout.

RESULTS

During the study period (August 2000 to March 2003) we recruited 94 women with twin pregnancies presenting with threatened preterm labor but only 87 satisfied the entry criteria because three had cervical cerclage and four were found to be in active labor. In the 87 pregnancies, which included 73 (84%) dichorionic and 14 (16%) monochorionic twins, the median gestation at presentation was 30 (range, 24–36) weeks and the median cervical length was 20 (range, 1–45) mm. The demographic characteristics of the women are shown in Table 1. All patients were hospitalized, 82 (94%) received corticosteroids for fetal lung maturity, 54 (62%) received tocolytics (β-mimetics i.v.) and 22 (25%) also received prophylactic antibiotics (cephalosporins).

Delivery within 7 days of presentation occurred in 19/87 (22%) pregnancies. Univariate analysis demonstrated that cervical length, use of tocolytics and gestational age provided a significant contribution in predicting delivery within 7 days (Table 1). There was no significant contribution from chorionicity, ethnic origin, maternal age, BMI, parity, previous history of preterm delivery, cigarette smoking, contraction frequency, vaginal bleeding or the administration of antibiotics or steroids.

The relationship between gestation at presentation and cervical length is shown in Figure 1. Delivery within
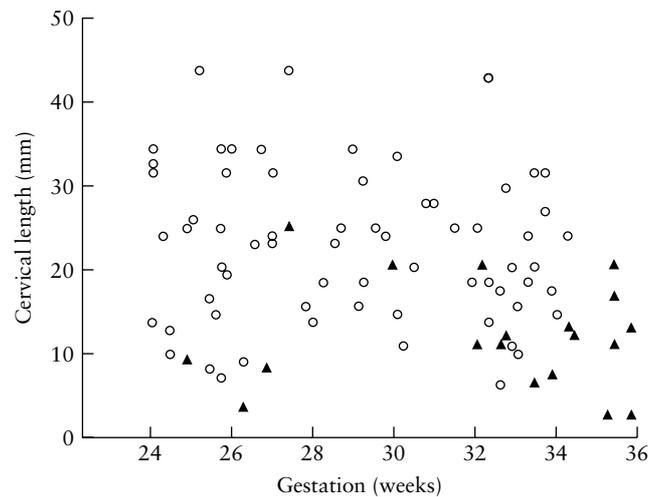

Figure 1 Cervical length distribution according to gestation at presentation in the group that delivered (▲) and in those that did not deliver (○) within 7 days.
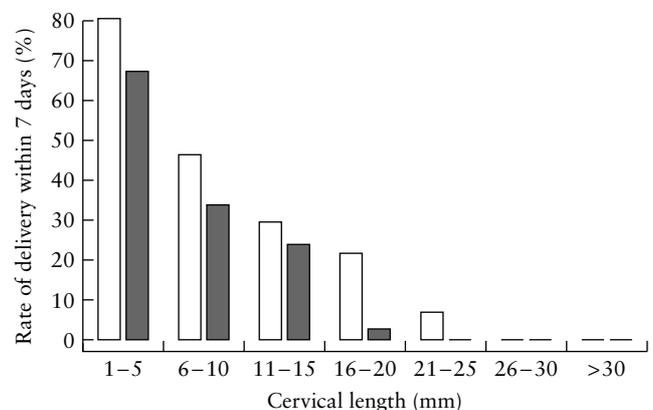

Figure 2 Rate of delivery within 7 days according to cervical length in the twin pregnancies in this study (open columns) and in singleton pregnancies from the authors' previous study[3] (shaded columns).

7 days was inversely related to cervical length, decreasing from 80% (4/5) at 1–5 mm, to 46% (6/13) at 6–10 mm, 29% (4/14) at 11–15 mm, 21% (4/19) at 16–20 mm, 7% (1/15) at 21–25 mm, and 0% (0/21) at > 25 mm (Figure 2). In the group with cervical length < 25 mm, delivery within 7 days occurred in 7/43 (16%) women who were treated with tocolytics and in 12/23 (52%) who were managed expectantly ($\chi^2 = 9.41$, $P = 0.002$; Figure 3). In the group with cervical length > 25 mm, none of the patients delivered within 7 days, including 10 women who were managed expectantly and 11 who were treated with tocolytics. In the group with cervical length ≤ 25 mm, delivery within 7 days occurred in 5/35 (14%) women who presented before 32 weeks of gestation and in 14/31 (45%) who presented at 32 weeks or later ($\chi^2 = 7.64$, $P = 0.006$; Figure 1).

Multivariate analysis demonstrated that significant independent contribution in the prediction of delivery within 7 days was provided only by cervical length (OR = 0.78, 95% CI 0.68–0.89, $P < 0.001$) and use of tocolytics (OR = 0.13, 95% CI 0.02–0.76, $P = 0.024$).

Table 1 Logistic regression for delivery within 7 days of presentation in the study population ($n = 87$)

Variable	n (%) or median (range)	Univariate analysis			Multivariate analysis		
		Odds ratio	95% CI	P	Odds ratio	95% CI	P
Cervical length (mm)	20 (1–45)	0.83	0.76–0.92	< 0.001	0.78	0.68–0.89	< 0.001
Maternal age (years)	28 (18–43)	1.10	0.99–1.21	0.061			
Gestational age (weeks)	30 (24–36)	1.35	1.12–1.62	0.001	1.18	0.95–1.47	0.120
Chorionicity				0.753			0.470
Monochorionic	14 (16%)	1.21	0.37–3.89		1.87	0.34–10.2	
Dichorionic	73 (84%)	1.00					
Ethnic origin				0.796			0.835
Caucasian	82 (94%)						
Non-Caucasian	5 (6%)						
Body mass index	27 (20–39)	0.96	0.86–1.07	0.489	0.97	0.84–1.11	0.649
Cigarette smoking				0.115			0.357
No	63 (72%)	1.00					
Yes	24 (28%)	2.36	0.81–6.88		1.95	0.47–8.14	
Parity				0.40			0.257
Nulliparous	44 (51%)	1.00					
Parous	43 (49%)	1.55	0.55–4.32		2.23	0.55–8.96	
Uterine contractions				0.167			0.232
One in 10 min	50 (58%)	1.00					
Two in 10 min	22 (25%)	2.99	0.94–9.48		4.05	0.81–20.24	
Three in 10 min	15 (17%)	1.31	0.30–5.73		1.51	0.24–9.52	
Use of tocolytics				0.013			0.024
No	33 (38%)	1.00					
Yes	54 (62%)	0.26	0.09–0.75		0.133	0.02–0.76	
Use of antibiotics				0.907			0.736
No	65 (75%)	1.00					
Yes	22 (25%)	1.07	0.33–3.41		1.30	0.27–6.23	
Use of steroids				0.796			0.846
No	5 (6%)						
Yes	82 (94%)						
Bleeding				0.296			0.577
No	76 (87%)	1.00					
Yes	11 (13%)	0.32	0.039–2.69		2.08	0.16–7.31	
Delivery within 7 days	19 (22%)						
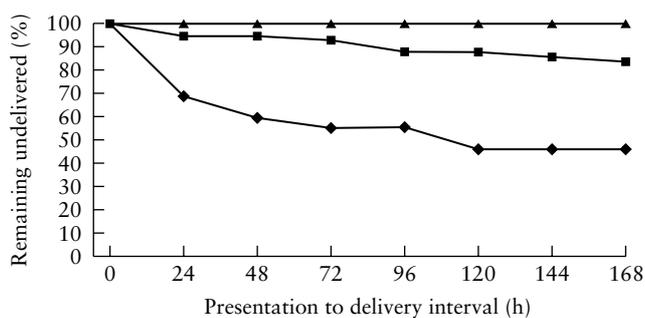
Figure 3 Survival curves according to cervical length and use of tocolytics. Cervix ≤ 25 mm, tocolytics ($\blacklozenge$) and no tocolytics ($\blacksquare$); cervix > 25 mm ($\blacktriangle$).

DISCUSSION

The findings of this study demonstrate that only about 20% of twin pregnancies presenting with threatened preterm labor deliver within the next 7 days. In a previous study of singleton pregnancies presenting with threatened preterm labor only 10% delivered within this interval[3]. In addition, the threshold of cervical length that distinguishes between true and false labor is 15 mm in singletons[3] compared to 25 mm in twins.

The rate of delivery within 7 days increased exponentially with progressive shortening of the cervix. In addition, use of tocolytics provided significant independent contribution in predicting delivery within this interval. This is compatible with the results of randomized studies on the use of tocolytics in threatened preterm labor. These studies have demonstrated a significant prolongation of pregnancy by about 7 days but no significant reduction in the overall incidence of preterm delivery[1,7]. There were no other significant factors predicting delivery within 7 days, and in particular we did not observe any chorionicity-dependent difference in risk. The incidence of preterm delivery at 24–32 weeks of gestation is twice as high in monochorionic compared to dichorionic twins[8]. However, this difference is almost entirely due to polyhydramnios of severe twin-to-twin transfusion syndrome (TTTS) that complicates about 15% of monochorionic twins. In our study there was only one case of severe TTTS and this was successfully treated by endoscopic laser coagulation of the communicating placental vessels.

A previous study examined sonographic cervical length after spontaneous or tocolytic-induced arrest of

contractions in 26 twin pregnancies presenting with threatened preterm labor at 23–33 (mean, 29) weeks of gestation[9]. The endpoint of the study was subsequent delivery before 34 weeks of gestation and this occurred in 5/14 (36%) women with cervical length < 30 mm and none of the 12 women with cervical length ≥ 30 mm. In our study we selected delivery within 7 days of presentation as the most sensible outcome measure. This represents the critical interval we can achieve by tocolysis, which is essential for the effective use of corticosteroids for improvement in lung maturity. We therefore believe that establishing risk parameters characterizing this endpoint of 7 days, rather than delivery before 34 weeks, is most relevant for a risk-adapted management of women presenting in threatened preterm labor.

The cut-off in cervical length that apparently distinguishes between false and true labor in twin pregnancies presenting with threatened preterm labor was 25 mm. This is compatible with findings in asymptomatic twin pregnancies undergoing cervical assessment at 22–26 weeks[10–17]. Thus, in a study of 464 twin pregnancies examined at 23 weeks, the risk of spontaneous preterm delivery before 33 weeks increased exponentially with decreasing cervical length from about 2.5% at 60 mm, to 12% at 25 mm and 80% at 8 mm and the incidence of cervical length below 25 mm was 12%[15]. In contrast, in singleton pregnancies the cervical length that apparently distinguishes between false and true labor is 15 mm, which is also true in identifying the high-risk group for early preterm delivery among women undergoing cervical assessment at 23 weeks. Thus, in one such screening study, the risk increased exponentially with decreasing cervical length from about 0.2% at 60 mm, to 4.0% at 15 mm and 78% at 5 mm and the incidence of cervical length below 15 mm was 1.5%[18]. In twin pregnancies presenting with threatened preterm labor the incidence of cervical length below 25 mm was about 75%, and in our previous study of symptomatic singleton pregnancies the incidence of cervical length below 15 mm was 20%[3]. Thus, both in symptomatic and asymptomatic pregnancies the incidence of those with cervical length below the threshold for exponential increase in risk for early delivery is much higher in twins compared to singletons. This is not surprising because the incidence of early preterm delivery in twins is five to ten times higher than in singletons.

The findings of this study suggest that sonographic measurement of cervical length in women presenting in threatened preterm labor can define the risk of delivery within 7 days and may help distinguish between true and false labor. The value of tocolytics and steroids in twin pregnancies presenting in threatened preterm labor will need to be determined by randomized studies in which the study populations are stratified according to cervical length.

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