Ultrasound assessment of cervical length in threatened preterm labor

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ABSTRACT

Objective *More than 70% of women presenting with threatened preterm labor do not progress to active labor and delivery. The aim of this study was to investigate the hypothesis that in women with threatened preterm labor, sonographic measurement of cervical length helps distinguish between true and false labor.*

Methods *We examined 216 women with singleton pregnancies presenting with regular and painful uterine contractions at 24–36 (mean, 32) weeks of gestation. Women in active labor, defined by the presence of cervical dilatation ≥ 3 cm, and those with ruptured membranes were excluded. On admission to the hospital a transvaginal scan was performed to measure the cervical length. The subsequent management was determined by the attending obstetrician. The primary outcome was delivery within 7 days of presentation.*

Results *In 173 cases the cervical length was ≥ 15 mm and only one of these women delivered within 7 days. In the 43 cases with cervical length < 15 mm delivery within 7 days of presentation occurred in 16 (37%) including 6/14 (42%) treated with tocolytics and 10/29 (35%) managed expectantly. Logistic regression analysis demonstrated that the only significant contributor in the prediction of delivery within 7 days was cervical length < 15 mm (odds ratio = 101, 95% CI 12–800, P < 0.0001) with no significant contribution from ethnic group, maternal age, gestational age, body mass index, parity, previous history of preterm delivery, cigarette smoking, contraction frequency or use of tocolytics.*

Conclusions *In women with threatened preterm labor, sonographic measurement of cervical length helps distinguish between true and false labor. Copyright © 2003 ISUOG. Published by John Wiley & Sons, Ltd.*

INTRODUCTION

Preterm delivery is the leading cause of neonatal mortality and morbidity. Consequently, women presenting with threatened preterm labor are often treated with hospitalization and the administration of tocolytics to avoid preterm delivery. Randomized studies on the use of tocolytics in threatened preterm labor have demonstrated a significant prolongation of pregnancy by about 7 days but no significant reduction in perinatal mortality or morbidity[1,2]. Furthermore, many studies have shown that more than 70% of women presenting with threatened preterm labor are not in true labor and do not deliver within 7 days[2].

The aim of this study was to examine the potential role of sonographic measurement of cervical length at presentation in women with threatened preterm labor in distinguishing between those that deliver within 7 days from those that do not.

PATIENTS AND METHODS

This was a prospective observational study of sonographic measurement of cervical length in women with singleton 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. Women in active labor, defined by the presence of cervical dilatation ≥ 3 cm, and those with ruptured membranes were excluded. The study was carried out at Harold Wood Hospital, Romford; King George Hospital, Ilford; St Mary's Hospital, Portsmouth and Homerton Hospital, London. Written informed consent was obtained from those women agreeing to take part in the study, which was approved by the research ethics committee of each hospital.

ORIGINAL PAPER

Transvaginal sonography was carried out by sonographers who had received The Fetal Medicine Foundation Certificate of Competence in Cervical Assessment. A 5-MHz transducer was placed in the vagina approximately 3 cm proximal to the cervix to avoid any cervical distortion of its position or shape and a sagittal view of the cervix, with the echogenic endocervical mucosa along the length of the canal, was obtained (Figure 1). The calipers were used to measure the distance of the cervical canal between the furthest points at which the cervical walls were juxtaposed[3]. 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, was determined by the attending obstetricians, who were not aware of the ultrasound findings. The primary outcome measure was delivery within 7 days of presentation.

Statistical analysis

The effect of maternal age, ethnic origin (Caucasian, Afro-Caribbean, Asian), parity (multiparous, primiparous), gestation at presentation, cigarette smoking (yes or no), body mass index, history of previous preterm delivery or second-trimester miscarriage (yes or no), frequency of uterine contractions (one, two or more contractions per 10 min), use of tocolytics (yes or no) and cervical length (< 15 mm and ≥ 15 mm, based on the results of this study) on delivery within 7 days of presentation was investigated using logistic regression analysis. Two-sided *P* values are reported throughout.
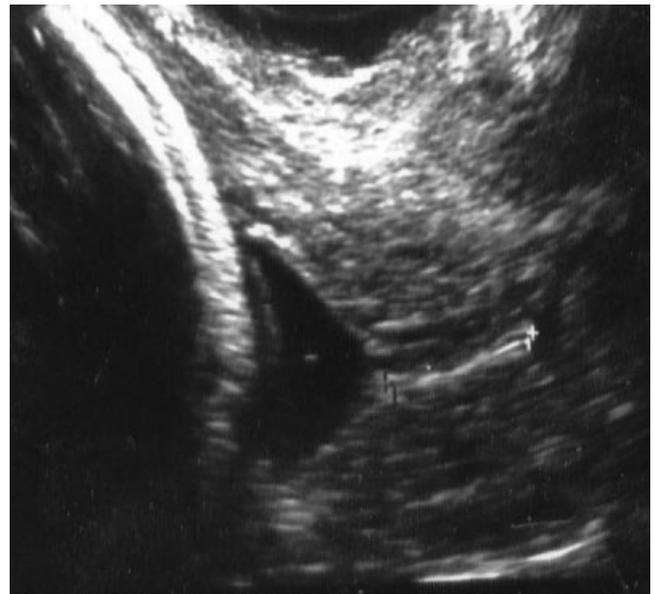

Figure 1 Measurement of cervical length by transvaginal sonography.

RESULTS

During the study period (February 2002 to January 2003) we recruited 216 women presenting with threatened preterm labor at a median gestation of 32 (range, 24–36) weeks. The median cervical length at presentation was 24 (range, 1–42) mm. The demographic characteristics of the women are shown in Table 1. All patients were

Table 1 Univariate analysis for delivery within 7 days of presentation in the study population ($n = 216$)

Variable	n (%) or median (range)	Odds ratio	95% CI	P
Cervical length				< 0.0001
≥ 15 mm	173 (80%)	1.00		
< 15 mm	43 (20%)	101.9	12.9–800.1	
Maternal age (years)	27 (16–42)	0.98	0.90–1.07	0.765
Gestational age (weeks)	32 (24–36)	1.01	0.87–1.17	0.817
Body mass index	24 (14–64)	1.07	0.99–1.15	0.071
Ethnic origin				0.016
Caucasian	153 (71%)	1.00		
Afro-Caribbean	42 (19%)	4.1	1.66–14.46	
Asian	21 (10%)	2.19	0.42–11.35	
Cigarette smoking				0.846
No	174 (81%)	1.00		
Yes	42 (19%)	0.87	0.24–3.21	
Parity				0.533
Nulliparous	74 (34%)	1.00		
Multiparous	142 (66%)	0.72	0.26–2.00	
Uterine contractions				0.804
One in 10 min	120 (55%)	1.00		
Two or more in 10 min	96 (45%)	1.13	0.42–3.06	
Use of tocolytics				0.337
No	161 (75%)	1.00		
Yes	55 (25%)	1.67	0.58–4.7	
Previous preterm delivery				0.778
No	183 (85%)	1.00		
Yes	33 (15%)	1.21	0.32–4.45	

hospitalized; they all received corticosteroids for fetal lung maturity and 55 (25%) also received tocolytics.

The relation between cervical length at presentation and gestation in those that delivered within 7 days and those that did not is shown in Figure 2. Delivery within 7 days of presentation occurred in 17/216 (7.8%) cases, including 16/43 (37%, 95% CI 23–51%) with cervical length < 15 mm and 1/173 (0.5%, 95% CI 0–1.5%) with cervical length ≥ 15 mm (Figures 3 and 4). In the group with cervical length < 15 mm, delivery within 7 days occurred in 6/14 (42%) cases that were treated with tocolytics and in 10/29 (35%) cases that were managed
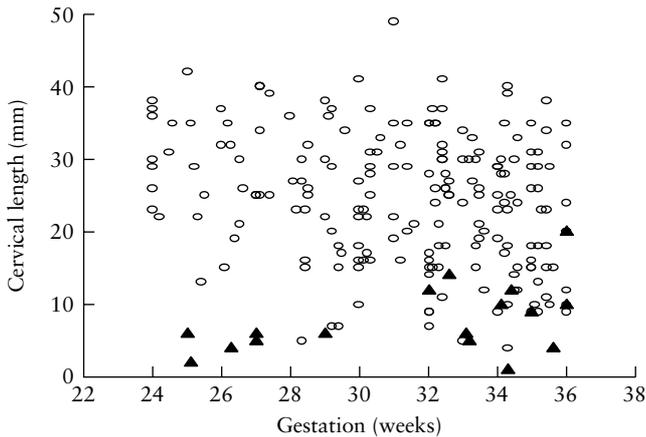

Figure 2 Cervical length distribution according to gestation at presentation in the group that delivered (▲) and those that did not deliver (○) within 7 days.

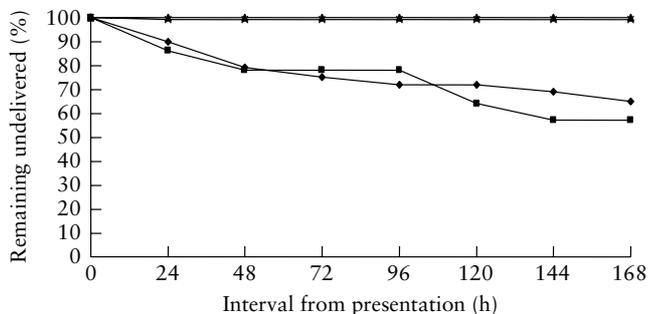**Figure 3** Survival curves for the four groups of women according to cervical length and tocolytic use. Cervix < 15 mm, no tocolytics (♦); cervix ≥ 15 mm, no tocolytics (∗); cervix < 15 mm, tocolytics (■); cervix ≥ 15 mm, tocolytics (▲).
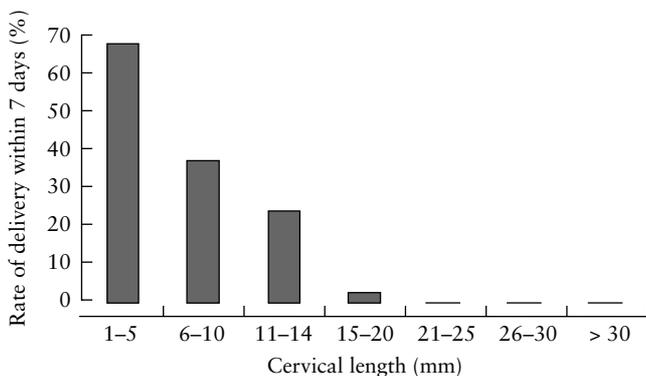

Figure 4 Rate of delivery within 7 days according to cervical length.

Table 2 Multivariate analysis for delivery within 7 days of presentation in the study population (*n* = 216)

Variable	Odds ratio	95% CI	P
Cervical length < 15 mm	161	18–1440	< 0.0001
Ethnic origin			0.074
Afro-Caribbean	5.13	1.19–22.12	
Asian	3.78	0.37–38.44	
Parity	3.88	0.93–16.15	0.063

expectantly. In the group with cervical length ≥ 15 mm or more, delivery within 7 days occurred in 1/132 (1%) cases that were managed expectantly and in 0/41 cases that were treated with tocolytics.

Univariate analysis demonstrated that cervical length and ethnic group provided a significant contribution in predicting delivery within 7 days (Table 1) but in the multiple regression model the only significant predictor was cervical length (Table 2).

DISCUSSION

The findings of this study demonstrate that less than 10% of women presenting with threatened preterm labor deliver within 7 days, and that in women with threatened preterm labor sonographic measurement of cervical length helps distinguish between true and false labor. Thus, delivery within 7 days of presentation occurred in about 40% of those with cervical length 0–14 mm and in less than 1% of those with cervical length ≥ 15 mm.

The high incidence of false labor in our study is compatible with the results of a recent randomized study on the use of antibiotics for preterm labor involving more than 6000 women[4]. In that study, it was stressed that there is no agreed definition of preterm labor or a reliable method of diagnosing it, and the decision for recruitment was therefore left to the attending obstetrician to ensure that the results are relevant to current clinical practice. The researchers reported that 85% of the study population remained undelivered after 7 days from presentation.

The cut-off in cervical length that apparently distinguishes between false and true labor in women presenting with threatened preterm labor is 15 mm. Previous studies examining cervical length (a) in asymptomatic women at 22–24 weeks in the prediction of early preterm delivery[5] and (b) in women having induction of labor for prolonged pregnancy[6] have also reported on the importance of this cervical length cut-off.

We found that a high proportion of women with cervical length < 15 mm delivered within 7 days of presentation, irrespective of whether they were treated with tocolytics or not. Several randomized studies have reported that in preterm labor the use of tocolytics is associated with a significant prolongation of pregnancy by about 7 days but not with reduction in the rate of preterm delivery[1,2]. Consequently, in the clinical management of patients with suspected preterm labor the primary aim of tocolytic administration is to achieve short-term delay

in delivery for effective use of corticosteroids. It is for this reason that we have selected delivery within 7 days of presentation, rather than delivery before 37 weeks, as the outcome measure of our study. Our findings suggest that measurement of cervical length may help distinguish between those patients that are unlikely to deliver within 7 days, irrespective of whether they receive tocolytics or not, and those with a short cervix who are at high risk of early delivery. The degree of effectiveness of tocolytics in patients with cervical length < 15 mm remains to be determined because none of the randomized studies of tocolytics has stratified the study population according to cervical length.

There are four previous studies examining sonographic measurement of cervical length on admission in women presenting with threatened preterm labor. Timor-Tritsch *et al.* examined 70 women presenting at 20–35 weeks and reported that in those delivering before 37 weeks the mean cervical length was shorter than in those delivering at term (16.9 mm vs. 31.9 mm)[7]. An observational study of 65 women presenting with preterm labor and treated with tocolytics at 26–35 weeks reported that the mean cervical length on admission in those with successful tocolysis was 27 (range, 9–45) mm, compared to 9 (range, 6–12) mm in the unsuccessful group[8]. Another study of 82 women presenting with preterm labor and treated with tocolytics at 24–34 weeks reported that the cervical length on admission was ≤ 20 mm in 57% of the 14 women that delivered within 28 days, compared to 7% in the 68 that delivered after 28 days[9]. Similarly, a study of 108 women presenting at 24–36 weeks reported that the cervical length on admission was ≤ 20 mm in 68% of the 47 women that delivered before 37 weeks, compared to 21% in the 61 that delivered at term[10].

The alternative to sonographic measurement of cervical length in predicting the outcome of women presenting in threatened preterm labor is biochemical assessment for the presence of fetal fibronectin in cervicovaginal secretions[11]. A recent systematic review of 40 studies on fetal fibronectin in women presenting with threatened preterm labor reported that the likelihood ratio for positive results for predicting delivery within 7–10 days of presentation was 5.42 (95% CI 4.36–6.74) and the ratio for negative results was 0.25 (95% CI 0.20–0.31)[12]. In a multicenter study involving 763 women presenting with threatened preterm labor, fetal fibronectin was positive in 20% of women. In those with a negative result 99.5% were still pregnant 7 days later, and in those with a positive result the incidence of delivery within 7 days was 13%[13]. Our findings, that the odds ratio for delivery within 7 days in women with cervical length of less than 15 mm was 101 (95% CI 12–800) and that the incidence of such delivery within this group was about 40%, suggest that short cervix may be better than fetal fibronectin positivity in identifying the high-risk group for imminent delivery. In terms of reassurance that delivery within 7 days is unlikely, the results of cervical length of ≥ 15 mm and negative fetal fibronectin appear to be similar.

The findings of this study suggest that sonographic measurement of cervical length in women presenting in threatened preterm labor may help distinguish between those that are likely to deliver within 7 days from those that are not.

ACKNOWLEDGMENT

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