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# Cervical length as a predictor of pre-term birth in twin gestations

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The aim of this study was to determine the predictive value of cervical length as a risk factor for spontaneous pre-term birth in twin gestations. A retrospective chart review was carried out on patients with twin pregnancies referred to our multiples' clinic. Cervical length was measured by transvaginal ultrasonography. Patients with an indicated pre-term delivery or intervention were excluded from the analysis. Outcomes included preterm delivery < 28 and < 35 weeks gestation. After extracting the data, 2 × 4 tables were constructed. Likelihood ratios were then generated for cervical lengths ≤ 2.0 cm, ≤ 2.5 cm, ≤ 3.0 cm, and > 3.0 cm. Because of the limited number of measurements taken < 25 weeks gestation, we elected to collapse the tables, thereby achieving more meaningful results. For measurements taken before 30 weeks gestation, a shorter cervix did predict delivery < 28 weeks gestation (likelihood ratios for cervical lengths ≤ 2.0 cm, ≤ 2.5 cm, ≤ 3.0 cm, and > 3.0 cm were 4.43, 1.94, 0.97, and 1.02, respectively). The probability of preterm delivery < 35 weeks gestation increased with decreasing cervical length (likelihood ratios for cervical length ≤ 2.0 cm, ≤ 2.5 cm, ≤ 3.0 cm, and > 3.0 cm were 2.58, 1.66, 1.38, and 0.81, respectively). A shorter cervix measured before 30 weeks gestation was a stronger predictor of preterm delivery < 28 weeks compared to < 35 weeks gestation. Cervical length was not predictive of preterm delivery if measured after 30 weeks. Cervical length is predictive of preterm delivery < 28 weeks and < 35 weeks gestation when measured before 30 weeks gestation. No trend was seen when measured after 30 weeks gestation. A prospective study is currently underway to confirm these results. Twin Research (2000) 3, 213–216.

Keywords: pre-term labor, twins, cervical length, ultrasonography

## Introduction

Pre-term delivery continues to be the leading cause of perinatal morbidity and mortality.[1] Pre-term birth remains the most common complication of twin gestations, with approximately 40–50% of deliveries occurring at less than 37 weeks gestation.[2–4] Although twins account for only 1–2% of all pregnancies, they are responsible for 15–25% of neonatal mortality.[5–7]

Several attempts have been made to prevent preterm delivery in twins including bedrest, tocolytics, uterine activity monitoring, and cerclage.[8–12] Unfortunately, none of these interventions have consistently been shown to increase the duration of gestation in twins. Furthermore, none of these interventions are without risks. Therefore, prior to proceeding with a trial of interventions, we must clearly identify those patients who are at risk of pre-term twin delivery.

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Classically, digital examination has been the gold standard for assessing the cervix. However, there remains great variability between examiners.[13] Therefore, the usefulness of cervical digital examination is somewhat controversial.[14,15] Recently, transvaginal ultrasound has become an increasingly popular tool for assessing cervical length as it is more objective and reliable.[5,16,17]

The literature suggests that cervical length is an independent risk factor for preterm delivery.[16] However, to date, there have been only a few studies looking at cervical length specifically in twins.[2,5,6,17,18] We wanted to review our own data to determine if a risk does exist and, furthermore, to use this information to identify those women with twin pregnancies who may benefit from preventive intervention.

## Methods

A retrospective chart review was carried out on patients with twin pregnancies who were referred to the multiples' clinic at our institution. This clinic is a specialized clinic in a tertiary center developed to care for all multiple pregnancies, both low and high

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risk, in our referral area. All women pregnant with twins have planned scheduled visits at 12 weeks, 18 weeks, 24 weeks, and 30 weeks and 34 weeks. Patients with additional risk features are seen as often as clinically indicated. At each visit an abdominal ultrasound is performed and in addition at the 18th, 24th and 30th week a transvaginal ultrasound for the measurement of cervical length is conducted. Patients are cared for and delivery is by the referring primary practitioner and delivery at the referring hospital if at over 34 weeks' gestation. All twins delivered prior to 34 weeks, or those who develop other complications, remained in the care of our hospital, allowing for complete data on deliveries under 34 weeks. All the patients attending this clinic in the years 1997–1998 were included in this study. Data from patients who had an indicated preterm delivery before 35 weeks GA or received a preventive intervention (other than bedrest) were excluded from the analysis. Transvaginal ultrasound was performed at each visit during the ADR Ultramark IX. Patients were instructed to empty their bladder prior to the examination. Measurements of the cervical canal were taken from the internal os to the external os, and the distance in cm was noted (Figure 1). This method has been shown to be reproducible with an inter-observer variability of 5–10%.[2,5] The patients were then grouped according to when the measurements were taken (ie < 20 weeks, 21–25 weeks, 26–30 weeks, and 31–35 weeks.

The primary outcomes were defined as preterm delivery < 28 weeks and < 35 weeks gestation on an a priori basis. The results of these outcomes were not noted on their clinic charts and thus were not available to the investigator at the time the cervical length measurements were being collected. We also chose cut-off values of 2.0 cm, 2.5 cm, 3.0 cm and > 3.0 cm for cervical length on an a priori basis. Once all data was extracted, 2 × 4 tables were constructed and the likelihood ratios were then generated for the various cervical lengths, using cut-offs of ≤ 2.0 cm, ≤ 2.5 cm, ≤ 3.0 cm, and > 3.0 cm. The positive predictive value of each likelihood ratio was then calculated.

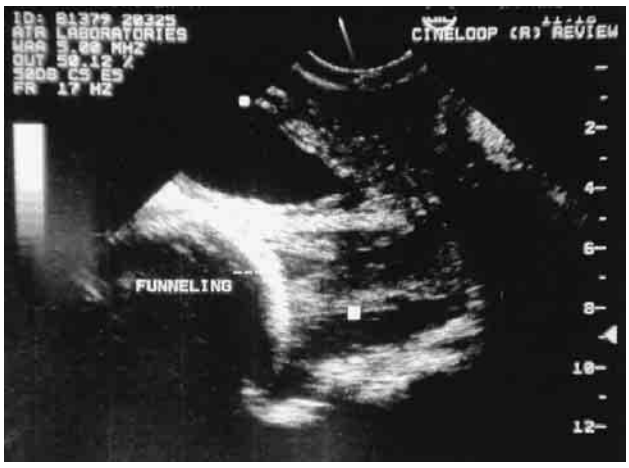


Figure 1 Transvaginal scan of cervix showing funneling of internal os and an effective cervical length of 1.2 cm

## Results

Eighty patient charts were reviewed. Fourteen patients were excluded from the analysis, either due to an indicated pre-term delivery or having received some type of intervention (Table 1). A total of 66 patients was included in the analysis. Of these, 38 patients had more than one cervical length measurement. In the case where a repeat measurement was performed within the cut-off of the same time period, the most recent measurement was recorded for the purposes of analysis. This resulted in a total of 120 measurements, representing 66 patients, in the analysis.

Initially, we had divided the patients into groups based upon their gestational age at the time the cervical length measurements were taken. We arbitrarily chose cut-offs of ≤ 20 weeks (n = 17), 21–25 weeks (n = 38), 26–30 weeks (n = 41), and 31–35 weeks (n = 24). However, due to the small number of measurements taken at ≤ 20 weeks and at 21–25 weeks, we elected to collapse the tables in order to achieve more meaningful results. Ultimately, we summarized the data in tables representing all cervical length measurements taken before 30 weeks' gestation, and those measured after 30 weeks.

The overall incidence of delivery under 28 weeks was 3%, and 13.6% of patients delivered before 35 weeks gestation. The likelihood of delivery under 28 weeks if the cervical length was ≤ 2.0 cm, and the measurement was taken before 30 weeks, was 4.43. Likelihood ratios for cervical lengths of ≤ 2.5 cm, ≤ 3.0 cm and > 3.0 cm were 1.94, 0.97, and 1.02, respectively. The positive predictive value for each

Table 1 Patients excluded from study

| Reason for exclusion | No. of patients |
|---|---|
| Abruption | 1 |
| IUGR | 2 |
| Chorioamnionitis | 4 |
| Cervical cerclage | 1 |
| Discordant growth | 2 |
| Poor BPP | 1 |
| Pre-eclampsia | 1 |
| Twin–twin transfusion syndrome | 1 |
| Mono-amniotic twins | 1 |



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likelihood ratio was also calculated (Table 2). Therefore, from our data, one can conclude that a short cervical length is, in fact, predictive of preterm twin delivery provided that the cervical length measurement was taken before 30 weeks' gestation.

When the cervical length was measured before 30 weeks' gestation, our data generated likelihood ratios of 2.58, 1.66, 1.38, and 0.81 for cervical length measurements of ≤2.0 cm, ≤2.5 cm, ≤3.0 cm, and >3.0 cm, respectively for pre-term delivery under 35 weeks gestation. We therefore concluded that within the specified time frame, as the cervical length increases the probability of pre-term twin delivery under 35 weeks decreases.

Furthermore, one can conclude that a short cervical length measured before 30 weeks' gestation has a stronger predictive value in predicting pre-term twin delivery before 28 weeks' gestation as compared with delivery prior to 35 weeks (Figure 2). In contrast, no trend was seen in predicting pre-term twin delivery if the cervical length was measured after 30 weeks' gestation. The likelihood ratios were 1.75, 2.33, 0.93, and 1.17 for cervical length measurements of ≤2.0 cm, ≤2.5 cm, ≤3.0 cm, and >3.0 cm, respectively. In other words, cervical length was not predictive of preterm delivery if measured after 30 weeks' gestation.

## Discussion

Our findings suggest that a shortened cervix is, in fact, predictive of preterm delivery in twin gestations. This is in keeping with the conclusion of previous studies.[2,6,18] When measured before 30 weeks' gestation, a short cervix is predictive of preterm twin delivery before 28 weeks, and before 35 weeks' gestation with a stronger predictive value for delivery under 28 weeks. This is in keeping with the concept that the cervical length gradually decreases during the third trimester in patients with a twin pregnancy.[5,18,19]

While this information is useful, we recognize that there are a few limitations to our study. First, this was a retrospective review, and the caregivers were not blinded to the ultrasonographic findings. Although we excluded any patient who, to our knowledge, received any intervention, we did not exclude specifically those patients who were prescribed bedrest by their physicians. The reason for this is that we found it difficult to realistically quantify the amount of activity experienced by each patient. In order to minimize selection bias, we remained blind to the outcome variables when we were extracting the cervical length data. Secondly, whilst this referral clinic is open to all patients, not every woman with a twin pregnancy delivering in our hospital's region was seen in it. It is possible that the patients attending this clinic are either higher or lower risk than those not attending this specialized service, which could render these results not generalizable to a wider population. Finally this study is of a relatively small sample size, particularly in those women who had ultrasounds at under 20 weeks and between 21 and 25 weeks' gestation. We did not keep data on cervical funneling as we found this observation to be widely variable and difficult to reproduce across occasions. It would be interesting to note whether a subgroup of patients with a short funneled cervix, whether spontaneously or in response to fundal pressure, are at higher risk of pre-term birth than those with an unfunneled cervix of the same length.

However, notwithstanding these limitations, the results are in keeping with the conclusion of most of the previous studies in this area.[2,6,18] In particular, the large multicenter prospective trial by Goldenberg et al found that a cervical length of under 2.5 cm at 24 weeks' gestation was associated with a 26.9% chance of delivery before 32 weeks, compared with 5.0% if the cervix was longer than 2.5 cm. The study by Wennerholm et al concluded that screening with cervical sonography at 24 to 34 weeks' gestation had no predictive value for preterm birth. This apparent conflicting result to our present study may be due to the fact that the clinicians were not blind to the results of the ultrasonographic findings. In contrast to our study, women who received tocolytic therapy or other interventions were included in their analysis. In summary, our results show that a cervical length is predictive of pre-term twin delivery under 28 weeks' gestation and under 35 weeks when measured by transvaginal sonography before 30 weeks' gestation. No trend was seen when the cervical length was measured after 30 weeks gestation. A

Table 2 Positive predictive values

| | Delivery <28 weeks GA | | Delivery <35 weeks GA (measurement ≤30 weeks) | | Delivery <35 weeks GA (measurement >30 weeks) | |
|---|---|---|---|---|---|---|
| Cervical length, cm | Likelihood ratio | Positive predictive value | Likelihood ratio | Positive predictive value | Likelihood ratio | Positive predictive value |
| ≤2 | 4.43 | 0.13 | 2.58 | 0.25 | 1.75 | 0.20 |
| ≤2.5 | 1.94 | 0.06 | 1.66 | 0.18 | 2.33 | 0.25 |
| ≤3.0 | 0.97 | 0.03 | 1.38 | 0.15 | 0.93 | 0.12 |
| >3.0 | 1.02 | 0.03 | 0.81 | 0.10 | 1.17 | 0.14 |



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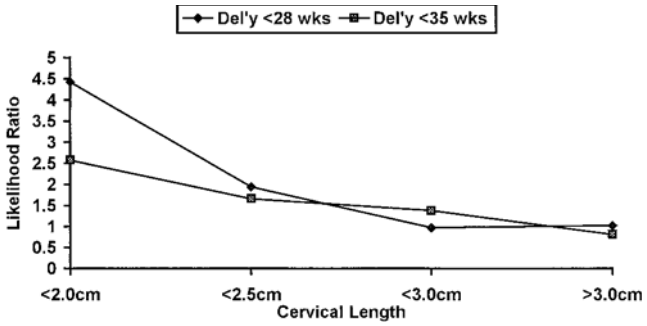


Figure 2

prospective trial is currently underway at our institution to confirm these findings as well as to investigate measures that might be applied to reduce the risk of pre-term delivery in this subgroup of patients.

## References

1 Kierse MJNC. New perspectives for the effective treatment of preterm labor. Am J Obstet Gynecol 1995; 173: 618–628.
2 Imseis HM, Albert TA, Iams JD. Identifying twin gestations at low risk for preterm birth with a transvaginal ultrasonographic cervical measurement at 24–26 weeks' gestation. Am J Obstet Gynecol 1997; 117: 1149–1155.
3 Brown JE, Schloesser PT. Pregnancy weight status, prenatal weight gain, and the outcome of term twin gestations. Am J Obstet Gynecol 1990; 162: 182–186.
4 Rush RS, Kierse MJNC, Howat P, Baum JD, Anderson AB, Turnbull AC. Contribution of preterm delivery to perinatal mortality. Br Med J 1976; 2: 965–968.
5 Kushnir O, Izquierdo LA, Smith JF, Blankenstein H, Curet LB. Transvaginal sonographic measurement of twin pregnancies. J Reproduct Med 1995; 40: 380–382.
6 Goldenberg RL, Iams JD, Miodovnik M, Van Dorsten JP, Thurnau G, Bottoms S, Mercer BM, Meis PJ, Moawad AH, Das A, Caritis SN, McNellis D, and the National Institute of Child Health and Human Development Maternal Fetal Medicine Units Network. The preterm prediction study: risk factors in twin gestations. Am J Obstet Gynecol 1996; 175: 1047–1053.
7 Gardner MO, Goldenberg RL, Cliver SP, Tucker JM, Nelson KG, Copper RL. The origin and outcome of preterm twin pregnancies. Obstet Gynecol 1995; 85: 553–557.
8 Nageotte MP. Prevention and treatment of preterm labor in twin gestation. Clin Obstet Gynecol 1990; 33: 61–68.
9 Rust OA, Perry KG Jr, Andrew ME, Roberts WE, Martin RW, Morrison JC. Twins and preterm labor. J Reprod Med 1997; 42: 229–234.
10 Knuppel RA, Lake MF, Watson DL, Welch RA, Hill WC, Fleming AD, Martin RW, Bentley DL, Moenning RK, Morrison JC. Preventing preterm birth in twin gestation: home uterine activity monitoring and perinatal nursing support. Obstet Gynecol 1990; 76: 24S–27S.
11 Crowther CA, Verkuyl DAA, Neilson JP, Bannerman C, Ashurst HM. The effects of hospitalization for rest on fetal growth, neonatal morbidity and length of gestation in twin pregnancy. Br J Obstet Gynecol 1990; 97: 872–877.
12 Ashworth MF, Spooner SF, Verkuyl DAA, Wareman R, Ashurst HM. Failure to prevent preterm labour and delivery in twin pregnancy using prophylactic oral salbutamol. Br J Obstet Gynecol 1990; 97: 878–882.
13 Buoyer K, Papiernik E. Risk factors identified during prenatal consultation. In: Papiernik E, Dreyfus J (eds). Effective Prevention of Preterm Birth: The French Experience Measured by Haguenau, vol 25, no 1. March of Dimes Birth Defects Foundation: White Plains, NY, 1989; pp 39–72.
14 Houlton MCC, Mariate M, Philpott RH. Factors associated with preterm labour and changes in the cervix before labour in twin pregnancy. Br J Obstet Gynecol 1982; 89: 190–194.
15 O'Connor MC, Arias E, Royston JP, Dalrymple IJ. The merits of special antenatal care for twin pregnancies. Br J Obstet Gynecol 1981; 88: 222–230.
16 Roberts WE, Morrison JC. Has the use of home monitors, fetal fibronectin, and measurement of cervical length helped predict labor and/or prevent preterm delivery in twins? Clin Obstet Gynecol 1998; 41(1): 95–102.
17 Crane JMG, Van Den Hof M, Armson BA, Liston R. Transvaginal ultrasound in the prediction of preterm delivery: singleton and twin gestations. Obstet Gynecol 1997; 90: 357–363.
18 Wennerholm UB, Holm B, Mattsby-Baltzer I, Nielsen T, Platz-Christensen J, Sundell G, Hosseini N, Hagberg H. Fetal fibronectin, endotoxin, bacterial vaginosis and cervical length as predictors of preterm birth and neonatal morbidity in twin pregnancies. Br J Obstet Gynecol 1997; 104: 1398–1404.
19 Zorzoli A, Soliani A, Perra M, Caravelli E, Galimberti A, Nicolini U. Cervical changes throughout pregnancy as assessed by transvaginal sonography. Obstet Gynecol 1994; 84: 960–964.



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