

**Research Article**

**Risk scoring to predict preterm birth before 34 weeks in women receiving cervical cerclage**

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**Abstract**

**Aim :** To study the risk factors associated with preterm birth in women with cervical cerclage by developing a scoring system

**Material & methods :** A retrospective cohort study was conducted including 50 patients who received cerclage between 14 to 28 weeks for cervical insufficiency. The 15 women (cases) delivering before 34 weeks were compared with control group including those who delivered after 34 weeks.

**Results :** Our study identified 4 risk factors associated with preterm birth at less than 34 weeks period of gestation : cervical length <20 mm prior to cerclage placement, emergency placement of cerclage, period of gestation of placement of cerclage 21-26 weeks, history of  $\geq 4$  losses. The positive predictive value calculated using the prediction model was 99% with a risk score of  $\geq 3$ , 94% with score 2 & 80% with score 1.

**Conclusion :** The utility of the prediction model as a tool for identifying patients at a higher risk for PTD <34 weeks & could be a useful tool for counselling high risk patients prior to cerclage and for identifying those women with cerclage who require increased surveillance.

**Keywords:** Risk score, predictive value, cerclage, preterm delivery

**1. Introduction**

Cervical insufficiency is primarily a clinical diagnosis, characterised by recurrent painless dilation and spontaneous mid trimester loss. Despite the recent advances, the indications for and efficacy of cervical cerclage still remains controversial<sup>1-3</sup>. Analysis of clinical history and various risk factors is essential to judge the indications and timing of placement of cervical cerclage. The efficacy of cerclage to prolong pregnancy still remains a subject of controversy, as shown by previous studies<sup>1-5</sup>. Evaluation of the risk factors contributing to preterm delivery in women receiving cerclage is of utmost importance, as the most common cause of perinatal mortality is preterm birth.

The aims of this study are to evaluate the risk factors associated with preterm birth in women receiving cervical cerclage and to develop a scoring system for preterm birth in these women. This prediction model can be used as a tool for identifying women likely to develop preterm birth and thus can be offered frequent surveillance.

**2. Material & Methods**

This was a retrospective cohort study done in 50 patients who received cervical cerclage from January 2008 to December 2011 at a tertiary care teaching hospital. Inclusion criteria were : singleton pregnancy between 13 – 28 weeks,

with cervical length less than 25 mm with or without funnelling on transvaginal ultrasound in women with previous one or more spontaneous preterm birth, history of either more than two spontaneous preterm births or more than two spontaneous mid trimester losses. Patients with previous one or more loss with either Mullerian anomaly or cervical amputation were also included in the study. Patients with multiple gestation or placenta previa were excluded. We searched operation theatre register to identify all the patients in whom cervical cerclage was performed. The hospital notes were then examined to obtain details of demographic characteristics, sonographic findings, operative procedures and pregnancy outcome.

These patients were then evaluated for the risk factors associated with preterm delivery <34 weeks, which included : indication of cerclage (history or ultrasound based), gestational age at cerclage placement, cervical length prior to cerclage and the timing of cerclage (prophylactic or emergency). Prophylactic cerclage was placed in the absence of documented sonographic changes and emergency cerclage was performed secondary to painless dilatation of >2 cm on digital examination. The cerclage was removed at the onset of labour or at 37 completed weeks.

The patients who delivered before 34 weeks were taken as cases and compared with the control group which consisted of the patients who delivered after 34 weeks. To test the association of various risk factors with the occurrence of preterm birth, univariate analysis was done using Pearson's chi square test and Fisher's exact test for categorical and continuous variables respectively. The logistic regression model included variables that were significantly associated with preterm delivery in the univariate analyses and multivariate analyses was then applied to calculate adjusted odds ratio. The goal of the predictive model was to identify patients receiving cervical cerclage that are likely to develop spontaneous preterm delivery at less than 34 weeks. Finally, a risk scoring system was developed assigning a score depending on the presence or absence of a significant risk factor for spontaneous preterm delivery, using the regression model. Each risk factor was weighted according to the odds ratio from the explanatory model and the best model was with maximum positive predictive value.

### 3. Results

We identified 50 women receiving cerclage between January 2008 to December 2011, those who fulfilled the inclusion criteria. Table 1 depicts the demographic and high risk characteristics for the study population.

**Table 1 : Demographic characteristics of study population**

	N = 50	%
Mean maternal age	26.9 ± 3.8	-
Previous 1 loss	6	12.0
Previous 2 losses	26	52.0
Previous 3 losses	15	30.0
Previous ≥ 4 losses	3	6.0
Mullerian anomaly	2	4.0
Previous failed cerclage	1	2.0
Cervical amputation	1	2.0

Preterm delivery at less than 34 weeks occurred in 15 (30%). Various risk factors which could be associated with preterm birth in these patients were studied in all these patients and an association of each risk factor was tested using univariate analyses. To calculate the adjusted odds ratio, multivariate analyses was done as shown in Table 2.

**Table 2 : Multivariate analyses of risk factors associated with preterm birth less than 34 weeks in women with cervical cerclage**

Risk factor	Adjusted ratio	95% confidence interval	P value
<b>Previous history</b>			
Previous 1 loss	2.82	0.13 – 2.36	0.70
Previous 2 losses	2.36	0.57 – 8.96	0.44
Previous 3 losses	0.81	0.21 – 3.46	0.76
Previous $\geq 4$ losses	0.21	0.04 – 0.71	0.01
Mullerian anomaly	1.27	0.13 – 12.38	1.00
Cervical amputation	0.58	0.16 – 2.11	0.67
<b>Gestational age at placement</b>			
13 – 16 weeks	2.58	0.56 – 13.75	0.36
17 – 20 weeks	0.47	0.18 – 1.58	0.34
21 – 26 weeks	0.25	0.05 – 0.78	0.03
<b>Timing of cerclage</b>			
Prophylactic	2.68	0.04 – 1.00	0.35
Emergency	0.20	0.34 – 3.69	0.03
<b>Cervical length on TVS</b>			
< 25 mm	1.22	0.33 – 3.79	0.76
< 20 mm	0.18	0.05 – 0.95	0.04

The risk factors with significant association with the occurrence of preterm delivery ( $p < 0.05$ ) were sought from the above analyses. In the present study, the significant risk factors for preterm delivery at less than 34 weeks were : cervical length <20 mm prior to cerclage placement, emergency placement of cerclage, period of gestation of placement of cerclage at 21-26 weeks, history of  $\geq 4$  losses each loss defined as either spontaneous preterm delivery or midtrimester loss. Patients were assigned a preterm delivery risk score according to the presence or absence of each significant risk factor. Using these four risk factors, a predictive model was designed and positive predictive value of this model was calculated for individual risk score, as shown in Table 3.

**Table 3 : Predictive model for preterm birth at less than 34 weeks**

Risk factor score	Sensitivity %	Specificity %	PPV %	NPV %	Accuracy %
1	36	96	80	77	77
2	57	98	94	83	85
$\geq 3$	28	100	99	75	78

The positive predictive value of preterm birth before 34 weeks is 99% when there are three or more risk factors, 94% when there are two risk factors but only 80% when there is a single risk factor. Mean birth weight was  $1725 \pm 684$  gm and mean gestational age was  $32.8 \pm 4.10$  weeks. Out of the 15 preterm births in our study, 2 patients delivered at <28 weeks, 9 delivered between 28 to 32 weeks and 4 patients delivered between 32 to 34 weeks. There were 6 NICU admissions and total 4 perinatal deaths.

#### 4. Discussion

Being able to predict patients with cerclage at risk for preterm delivery would be important for counselling prior to performing cerclage procedures and in identifying the subset of women receiving cerclage who require increased surveillance. Kokia et al attempted to devise clinical prediction rule at the time of cerclage<sup>6</sup>. These authors evaluated 24 women at the time of emergency cerclage and proposed a cervical incompetence score depending on the degree of cervical effacement, dilatation and protrusion of membranes into the cervical canal. In their population, a low score was associated with a higher success of emergency cerclage. This scoring system was limited by its small size and was applied to women receiving emergency cerclage only. Odibo et al devised a prediction model for predicting preterm birth at less than 32 weeks, using three variables : a shortened cervix, history of cone biopsy and emergency cerclage<sup>7</sup>. The positive predictive value using a cut off of  $\geq 2$  was 82% in their model. Our predictive model using four variables demonstrated 93% and 100% positive predictive value for preterm delivery with two and three or more risk factors, respectively. The difference may be attributed to the different cut off of 32 weeks used in the previous study and the difference in the prevalence of preterm birth in their population.

The risk factors evaluated by our prediction rule are easily reproducible, reliable and clinically relevant. The limitations of our study include its retrospective design with possibility of introducing bias due to incomplete data.

#### 5. Conclusion

Our study identified four risk factors associated with spontaneous preterm delivery at less than 34 weeks in women receiving cervical cerclage : cervical length  $< 20$  mm prior to cerclage placement, emergency placement of cerclage, period of gestation of placement of cerclage at 21-26 weeks & history of  $\geq 4$  losses.

Women with  $\geq 3$  risk factors were most likely to develop preterm birth. The prediction model designed in our study can be used as a tool for counselling these patients before receiving cervical cerclage & for identifying those women who require frequent surveillance after cerclage placement.

#### References

1. Rush RW, Isaacs S, McPherson K, Jones L, Chalmers I, Grant A. A randomised controlled trial of cervical cerclage in women at high risk of spontaneous preterm delivery. *Br J Obstet Gynaecol* 1984; 91: 724-30
2. Berghella V, Daly SF, Tolosa JE, et al. Prediction of preterm delivery with transvaginal ultrasonography of the cervix in patients with high risk pregnancies : does cerclage prevent prematurity? *Am J Obstet Gynaecol* 1999; 18 : 809
3. Hassan SS, Romero R, Maymon E, et al. Does cervical cerclage prevent preterm delivery in patients with a short cervix? *Am J Gynaecol* 2004; 184 : 1325-31
4. Althuisius SM, Dekker GA, Pieter H, Bekedam DJ, Van Geijin HP. Final results of the Cervical Incompetence Prevention Randomised Cerclage Trial (CIPRACT) : therapeutic cerclage with bed rest versus bed rest alone. *Am J Obstet Gynecol* 2001; 185 : 1106-12
5. Odibo AO, Flousky M, Ural SH, Macones GA. Cervical cerclage compared with expectant management for the prevention of preterm birth : a systemic review. *Obstet Gynaecol Surv* 2003; 58 : 130-6
6. Kokia E, Dor J, Blakenstein J, et al. A simple scoring system for the treatment of cervical incompetence diagnosed during the second trimester. *Gynecol Obstet Invest* 1991; 31 : 12-6
7. Odibo AO, Farrell C, Macones GA, Berghella V. Development of a scoring system for predicting the risk of preterm birth in women receiving cervical cerclage. *J Perinat* 2003; 23 : 664-7