

Time to Delivery after Scheduled Shirodkar Cerclage Removal in Singleton Gestations based on the Original Indication for Cerclage Placement

Catherine A. Bigelow, MD¹ Nathan S. Fox, MD¹ Jennifer Lam-Rachlin, MD¹ Simi Gupta, MD¹
Mariam Naqvi, MD¹ Julie Romero, MD¹ Andrei Rebarber, MD¹

¹Department of Obstetrics, Gynecology and Reproductive Science, Icahn School of Medicine at Mount Sinai, New York, New York

Address for correspondence Catherine A. Bigelow, MD, Department of Obstetrics, Gynecology and Reproductive Science, Icahn School of Medicine at Mount Sinai, 5 East 98th Street, 2nd Floor, Room 249, New York, NY 10029 (e-mail: Catherine.Bigelow1@mssm.edu).

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Abstract

Objective To estimate the time to delivery after elective cerclage removal and evaluate whether there is a difference based on the indication for cerclage placement.
Study Design This was a retrospective cohort of singleton pregnancies that underwent Shirodkar cerclage placement at a single maternal-fetal medicine practice between June 2005 and June 2017. We included all scheduled elective cerclage removals >36 weeks. The primary outcome was latency to delivery. We further compared time to delivery based on the original indication for cerclage. Data were analyzed using the one-way analysis of variance and chi-square test.

Results A total of 143 patients met the inclusion criteria. Of these, 40.6% were history indicated, 51.0% ultrasound indicated, and 8.4% exam indicated. The mean time from removal to delivery was 13.3 ± 8.4 days; 12.6% (18/136) of patients delivered within 24 hours of removal. When stratified by indication for cerclage, there were no significant differences for all delivery outcomes. Delaying cerclage removal to >37 weeks resulted in a statistically significantly later gestational age at delivery compared with removal between 36 and 36^{6/7} weeks (39.0 vs. 38.3 weeks, $p = 0.001$).

Conclusion The mean time from elective Shirodkar cerclage removal to delivery is 13 days with only 12.6% of patients delivering within 24 hours of removal.

Keywords

- ▶ cerclage removal
- ▶ latency to delivery
- ▶ preterm birth
- ▶ Shirodkar cerclage

Preterm birth is a major cause of neonatal morbidity and mortality in the United States, where 9.6% of pregnancies end in preterm birth <37 weeks' gestation.¹ For women with a history of prior preterm birth or midtrimester loss, placement of a cerclage in the first trimester decreases the risk of subsequent preterm birth <33 weeks and decreases perinatal mortality.² Quality evidence shows that cerclage prolongs pregnancy in high-risk women with a short cervical length (CL) in women with a history of preterm birth³ and in women with painless cervical dilation in the midtrimester.^{4,5} Cerclage removal is typically performed between 36 and 38

weeks' gestation to avoid the potential for labor prior to removal,⁶⁻⁸ though there is relatively little published data about the latency between cerclage removal and delivery. Bisulli et al focused their study exclusively on patients who had McDonald cerclages placed. They found no difference in latency from removal to delivery based on indications when comparing history-indicated versus ultrasound-indicated cerclage.⁸ More recently, Alabi-Isama et al noted that the mean interval from cerclage removal to delivery was 14 days using either McDonald or Shirodkar technique; however, they noted that women with ultrasound-indicated cerclage

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were more likely to deliver within 3 days when compared with women with a history-indicated cerclage.⁹ Given the conflicting data about delivery timing based on initial indication for cerclage placement, as well as limited data on latency in the setting of a Shirodkar cerclage, we sought to evaluate these outcomes in our population. Finally, we present data on exam-indicated cerclage and latency to delivery for which a paucity of data exists given the low likelihood of reaching term in this population.

The objective of this study was to estimate the time to spontaneous delivery after elective Shirodkar cerclage removal and to evaluate whether there is a significant difference in latency interval based on the original indication for Shirodkar cerclage placement.

Materials and Methods

This was a retrospective cohort study of all singleton pregnancies that underwent Shirodkar cerclage placement at a single maternal–fetal medicine (MFM) practice in New York City between June 2005 and June 2017. In our practice, women at increased risk for preterm birth undergo CL screening with endovaginal ultrasound. Women with a history of multiple second trimester losses or preterm births or those with a prior “classical” second trimester loss from cervical insufficiency who decline serial CL screening are offered history-indicated cerclage.¹⁰ Ultrasound-indicated cerclage is offered in women with short cervix of 25 mm or less if there is a history of a prior preterm birth, prior midtrimester loss, or other risk factors that may affect the structural integrity of the cervix, such as cervical conization. In patients with asymptomatic cervical dilation in the mid-trimester and no evidence of labor or infection, exam-indicated cerclage is offered. All cerclages placed by our practice are modified Shirodkar cerclages using 5 mm Mersilene suture, following the previously-described technique.^{11,12} Cerclage removal is typically planned between 36 and 38 weeks. For this study, we included all cerclage removals >36 weeks, as earlier removal would only be for spontaneous preterm labor, preterm premature rupture of membranes, or planned delivery for maternal or fetal indication. Patients were also excluded if they were in labor or had ruptured membranes at the time of cerclage removal, if cesarean delivery was performed at the time of cerclage removal, or if labor was immediately induced following cerclage removal.

Patient demographic data including age, risk factors for preterm birth, and number of prior preterm births were collected for all patients. Preoperative CL (for ultrasound-indicated cerclage), preoperative cervical dilation (for exam-indicated cerclage), gestational age (GA) at the time of cerclage placement, and obstetric outcomes for the current pregnancy were collected. The primary outcome evaluated was time to spontaneous delivery after cerclage removal (latency). We further compared latency based on the original indication for cerclage placement (i.e., history, ultrasound, or examination) and evaluated the number of patients who delivered within 1 day and 1 week of cerclage removal. Data

were analyzed using the one-way analysis of variance and chi-square test, along with the Student’s *t*-test and Fisher’s exact test for Pearson’s correlation analysis (IBM SPSS for Windows 22.0, Armonk, NY, 2013). A *p*-value of <0.05 was considered statistically significant. The study was approved by the Biomedical Research Alliance of New York Institutional Review Board.

Results

There were 272 cerclages placed in singleton pregnancies during the study period. Of these, 90 (33.1%) had a spontaneous or indicated preterm birth <36 weeks prior to planned scheduled cerclage removal and 39 (14.3%) were scheduled for delivery on the same day as removal of the cerclage, leaving 143 patients eligible for inclusion in the study. Of these, 58 (40.6%) had a history-indicated cerclage, 73 (51.0%) had an ultrasound-indicated cerclage, and 12 (8.4%) had an exam-indicated cerclage. Demographic characteristics are presented in **Table 1**. The mean CL prior to ultrasound-

Table 1 Demographic information of patients undergoing Shirodkar cerclage removal

Characteristic	n (%) or mean ± SD
Maternal age (y)	33.4 ± 5.7
Indication	
History-indicated	58 (40.6%)
Ultrasound-indicated	73 (51.0%)
Physical exam-indicated	12 (8.4%)
Prior PTB	95 (66.4%)
Prior second trimester loss	86 (60.1%)
Prior cervical excision procedure	11 (7.7%)
Cerclage in a prior pregnancy	69 (48.3%)
GA at cerclage placement (wk)	18.0 ± 3.4
CL (mm) at the time of ultrasound-indicated cerclage placement	18 ± 6
Cervical dilation (cm) at the time of exam-indicated cerclage placement	
1 cm	9 (75%)
2 cm	1 (8.3%)
3 cm or more	2 (16.7%)
GA at cerclage removal (wk)	36.7 ± 0.5
GA at delivery (wk)	38.6 ± 0.5
Birth weight (g)	3,145 ± 438
Days from cerclage removal to delivery	13.3 ± 8.4
Delivered within 1 day of cerclage removal	18 (12.6%)
Delivered within 7 days of cerclage removal	39 (27.3%)

Abbreviations: CL, cervical length; GA, gestational age; PTB, preterm birth.

Table 2 Latency between cerclage removal and delivery stratified by indication for cerclage in the current pregnancy

	History indicated N = 54	Ultrasound indicated N = 71	Exam indicated N = 11	p-Value ^a
Time to delivery in days (mean ± SD)	11.7 ± 8.6	14.1 ± 8.1	14.1 ± 9.5	0.274
Delivered within 1 d (n, %)	10 (18.5)	5 (7.0)	3 (27.3)	0.591
Delivered within 1 wk (n, %)	19 (35.2)	17 (23.9)	3 (27.3)	0.260

Abbreviation: SD, standard deviation.

^aOne-way analysis of variance or chi-square test for trend.

indicated cerclage was 18 mm (standard deviation [SD] 6 mm) and the majority of patients (83.3%) undergoing exam-indicated cerclage were ≤2 cm dilated.

The mean GA at cerclage removal was 36.7 weeks (SD 0.5 weeks) and the mean GA at delivery was 38.6 weeks (SD 0.5 weeks). Overall, the mean latency from cerclage removal to delivery was 13.3 days (SD 8.4 days). Of the 143 patients, 18 (12.6%) delivered within 1 day of cerclage removal and 39 (27.3%) delivered within 1 week.

When stratified by the original indication for cerclage placement, there was no statistically significant difference between the mean time to delivery, the percentage of patients delivered within 1 day, or the percentage of patients delivered within 1 week (►Table 2). Of the 73 women undergoing ultrasound-indicated cerclage, CL prior to cerclage placement did not correlate with latency after cerclage removal ($R = 0.035$, $p = 0.767$) (►Table 3). There were insufficient numbers to perform a similar correlation

in the patients who underwent exam-indicated cerclage. Finally, we compared patients who had the cerclage removed electively between 36 and 36^{6/7} and 37 and 37^{6/7} weeks. There were no significant differences in the mean time to delivery following cerclage removal, the percentage of patients delivered within 1 day, or the percentage delivered within 1 week (►Table 4). Additionally, when the cerclage was removed between 37 and 37^{6/7} weeks, the mean GA at delivery was statistically significantly later (38.3 vs. 39.0 weeks, $p = 0.001$) (►Table 4). In the group of patients with cerclage removal 36 to 36^{6/7} weeks, 13 (14.8%) delivered preterm (<37 weeks), as compared with 0% in the group with removal after 37 weeks ($p = 0.002$). To examine any possible risk of waiting beyond 37 weeks for cerclage removal, we examined how many women were excluded from this study for having labor or premature rupture of membranes at the time of cerclage removal and were >37 weeks at the time of removal. Waiting until

Table 3 Latency to delivery after ultrasound-indicated cerclage removal stratified by cervical length at the time of cerclage placement

	Cervical length 2–15 mm N = 19	Cervical length 16–25 mm N = 54	p-Value ^a
Time to delivery in days (mean ± SD)	13.5 ± 8.2	14.0 ± 8.2	0.861
Delivered within 1 day (n, %)	1 (5.3)	4 (7.4)	0.999
Delivered within 1 week (n, %)	4 (21.1)	14 (25.9)	0.766

Abbreviation: SD, standard deviation.

^aStudent's t-test and Fisher's exact test.

Table 4 Delivery outcomes when cerclage removal was 36 to 37 weeks compared with 37 to 38 weeks

	Cerclage removed 36–36 ^{6/7} wk N = 88 ^a	Cerclage removed 37–37 ^{6/7} wk N = 54 ^a	p-Value ^b
Time to delivery in days (mean ± SD)	13.6 ± 8.7	13.0 ± 7.8	0.685
Delivered within 1 d (n, %)	12 (13.6)	6 (11.1)	0.661
Delivered within 1 wk (n, %)	24 (27.3)	14 (25.9)	0.860
Gestational age at delivery in weeks (mean ± SD)	38.3 ± 1.2	39.0 ± 1.1	0.001

Abbreviation: SD, standard deviation.

^aOne patient excluded who had cerclage removal at 39 weeks.

^bChi-square and Student's t-test.

37 to 37^{6/7} weeks to remove the cerclage led to four women (of 58 eligible women, 6.9%) presenting in labor prior to scheduled cerclage removal. All four had uncomplicated cerclage removals and deliveries without cervical laceration, hemorrhage, or labor dystocia.

Comment

Cerclage placement for the prevention of preterm birth is a well-established obstetric intervention, though timing of removal is less validated in the current literature. Cerclage removal before the onset of labor has been recommended by various groups to avoid complications such as cervical laceration (which may occur in 2–7.5% of cases),⁷ labor dystocia from cervical scarring, and uterine rupture.¹³ Shirodkar recommended removal of the cerclage at 36 weeks prior to attempted vaginal delivery,¹⁴ which has remained the typical removal timing in the subsequent obstetric literature.

We found that elective cerclage removal after 36 weeks was associated with a low rate of immediate delivery, with patients delivering 13 days after removal, on average. This is consistent with latency to delivery described by other groups of ~14 days.^{8,9} Additionally, other studies have reported a low rate of delivery within 48 to 72 hours of removal, though have not stratified latency by shorter time periods. Because of this limitation in the literature, we chose to further classify rates of delivery within 1 day of delivery and within 1 week. Similar to other groups, we report a low rate of delivery within 24 hours of elective cerclage removal (13% in our population, compared with 11% within 48 hours found by Bisulli et al and 18% within 72 hours by Alabi-Isama et al).^{8,9} Interestingly, we report no difference in cerclage removal to delivery latency even in the setting of exam-indicated cerclage placement when compared with the other two indications. This may indicate a reconstitution of the cervical integrity across gestation similar to those pregnancies in which the external os of the cervix had not been compromised and the membranes had not been exposed to the vaginal flora.

While cerclage removal is associated with a low risk of immediate delivery, almost 30% of our patients delivered within 1 week of removal. Even when stratifying patients by the gestational week of cerclage removal, this rate of delivery within 1 week remained constant. While there are theoretical risks of cerclage removal in labor, Abdelhak et al specifically evaluated rates of complications when cerclage removal was delayed until labor. In their study of 82 eligible pregnancies, 93% delivered at term with only 5 minor cervical lacerations (6%), 1 case of arrest of dilation (1%), and no cases of uterine rupture or uterine window noted at the time of cesarean delivery.⁷ Additionally, there were no long-term complications of delayed cerclage removal in their patient population, such as infertility, bladder disorders, fistula formation, granuloma formation, or dysmenorrhea. Similarly, we found that the only risk of waiting to >37 weeks for cerclage removal was the onset of labor prior to cerclage removal, which only occurred in 6.9% of patients with no subsequent complications of cerclage removal or delivery.

Given the body of literature about complications of late-preterm and early-term deliveries,^{15,16} the decision about timing cerclage removal and subsequent risk of late-preterm or early-term birth should be considered by obstetricians counseling their patients prior to cerclage removal.

Some of the strengths of our study include the large sample size, exclusive Shirodkar-type cerclage technique, and the fact that we have included exam-indicated cerclage latency, which previous studies have not reported. Additionally, the standardization of care in this single MFM practice dictates that all ultrasounds are reviewed by an attending physician and attendings perform cerclage placement and removal, which allows for minimal confounding based on technique. The study is limited by its retrospective nature and we recognize that our exclusive use of the Shirodkar technique may limit generalizability for providers who place McDonald cerclages for all indications.

In conclusion, for patients who remain pregnant until elective cerclage removal without preterm labor, the mean time from removal to delivery is 13 days, with only 13% of patients delivering within 1 day. Due to the low likelihood of delivery shortly after cerclage removal, it is reasonable to perform cerclage removal in the outpatient setting, though our group performs removal in the operating room for visualization and ease of removal of the Shirodkar cerclage. However, given that there is a risk of subsequent birth up to almost 30% within 7 days following cerclage removal, regardless of initial indication for cerclage, it may be prudent to recommend elective cerclage removal after 37 weeks to avoid neonatal complications of the late-preterm period, given the low risk of complications if the cerclage is removed in labor.

Conflict of Interest

None.

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