

Retrospective Study

Does change in cervical dilation after anesthesia impact latency after cerclage placement?

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Abstract

Background: Pregnant individuals with early cervical dilation have a high risk for preterm birth. The authors encountered cases where cervical dilation increased after anesthesia administration for a cerclage.

Objective: The primary objective was to assess if a change in cervical dilation after anesthesia administration for a cerclage was associated with a shorter latency to delivery.

Study design: This was a retrospective chart review of pregnancies from January 1, 2011, to December 31, 2021, who had a cerclage and delivered at our institution. Maternal demographics, obstetrical history, operative details, and delivery information were collected. Multi-fetal gestations, un-indicated cerclages, and abdominal cerclages were excluded. The primary outcome was the difference in cervical dilation between the office and the operating room after spinal anesthesia administration. A multivariable regression was performed.

Results: A total of 183 pregnancies were included. The mean gestational age at cerclage placement was 18 weeks (STDEV 3.6). Twenty-nine percent of patients (53/183) were more dilated in the operating room compared to the office. The latency between cerclage and delivery was not different if there was a cervical change between these settings ($p = 0.655$). There was an increased risk for preterm delivery with dilation in the office (OR 1.01, CI 1.01 to 2.5), but not with dilation in the operating room (OR 1.4, CI 0.9 to 2.0).

Conclusion: Cervical dilation between the office and the operating room is different. Pregnancies with more dilation delivered at earlier gestations. However, a change in dilation between the office and the operating room was not associated with a shorter latency.

Introduction

Preterm delivery before 37 weeks gestation affects 10% of pregnancies in the United States [1]. Risk factors such as race, weight, tobacco abuse, and history of preterm delivery increase the risk of preterm delivery [1]. The prediction and prevention of spontaneous preterm birth is limited and therefore continued investigation into labor mechanisms is essential. Both medical and surgical interventions, such as progesterone and cervical cerclage have been studied and used to help reduce the risk of preterm delivery [1-6].

There are three primary indications for transvaginal cerclage placement: premature cervical dilation (physical examination indicated), short cervix (< 25 millimeters) on ultrasound in the setting of a prior singleton preterm delivery

(ultrasound indicated), and history of cerclage in a prior pregnancy or preterm delivery with painless preterm cervical dilation (history indicated) [3]. All cerclage procedures have surgical risks such as bleeding, infection, rupture of membranes, pregnancy loss, and inability to place the cerclage. Regardless of cerclage indication, those with a dilated cervix are at increased risk for preterm birth [1-3].

The authors have observed that after the administration of anesthesia, the cervical exam can differ from the pre-surgical cervical exam. However, the rate of this occurrence and if this change is associated with a shorter latency is unknown. The first objective of this study is to determine if there is a change in cervical dilation after the administration of anesthesia for a cerclage. The second objective is to assess if a change in cervical dilation is associated with a shorter latency from cerclage placement to delivery. We hypothesize

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Keywords: Preterm; Cervical dilation; Cerclage; Gestational age; Physical exam indicated; An ultrasound indicated; History indicated





that an increase in cervical dilation after the administration of anesthesia is associated with a shorter latency between cerclage placement and delivery.

Materials and methods

This is a retrospective cohort study of pregnant individuals with singleton gestations, who had a transvaginal cerclage placed, either McDonald or Shirodkar, between January 1, 2011, and December 31, 2021, at our institution. This study was reviewed by the IRB and received approval (#6400) prior to starting data collection. STROBE guidelines were followed. Pregnant individuals who had a physical exam indicated, an ultrasound indicated, or history-indicated cerclage performed by an obstetrician were included. Elective cerclage was defined as having a cerclage performed for an indication other than what is defined per the American College of Obstetricians and Gynecologists (ACOG) [3].

Outpatient documentation was reviewed to determine if the patient had a digital cervical examination prior to the scheduled cerclage. Most patients had an exam in the outpatient office, at the time when the decision for surgery was made. This was categorized as the prior to neuraxial measurement. Cerclage operative reports were used to determine the after-neuraxial anesthesia measurement. The difference between the digital cervical exam prior to and after neuraxial anesthesia was calculated. Those with an increase in dilation (change) were compared to those without a change in dilation or a decrease in dilation (no change). The primary outcome was latency to delivery, which was calculated as the difference in weeks between the cerclage placement and delivery.

Pregnant individuals were excluded from the study if there was missing information from the pre-operative examination, operative reports, or delivery information. Additionally, those with multi-fetal gestations, elective cerclage placement, and abdominal cerclages were excluded. Other study variables collected included patient demographics, obstetrical history, and delivery information. The study period is selected based on the implementation and utilization of the electronic medical record at our institution.

The difference in cervical dilation between the office and the operating room was calculated and compared to a difference of zero (0). A *p* value for this difference was determined. Maternal demographics and other variables were analyzed separately with descriptive statistics as well as parametric and non-parametric tests. Non-normally distributed data were described with medians with the use of Mann U Whitney tests. Multivariable regression was performed with cervical dilation as the primary dependent variable. SPSS (version 28.01.0) statistical software was used for the data analysis.

Results

A total of 244 charts were reviewed, and 182 were included

Table 1: Maternal demographics.

Variable	N (%) or *Mean (STDEV)
Race	
Black	68 (37.2%)
White	75 (41.0%)
Other	10 (5.5%)
Unknown	30 (16.4%)
Ethnicity	
Hispanic	13 (7.1%)
Non-Hispanic	161 (88.0%)
Unknown	9 (4.9%)
History of Preterm Delivery	
Yes	114 (62.3%)
No	69 (37.7%)
Gravidity	4.4 (2.5)*
Living	1.2 (1.3)*

*Mean (STDEV); STDEV; Standard Deviation

with complete obstetrical, operative, and delivery records. Most pregnant individuals identified as Caucasian had a prior preterm birth and had a McDonald cervical cerclage. All patients had neuraxial anesthesia with either a spinal or epidural. All cases had successful placement of a transvaginal cerclage, and there were no immediate surgical complications. The remaining demographic information is represented in Table 1. A total of 95% (173/182) had a live birth and 4.9% (9/182) had a neonatal death. Of those with neonatal death, the gestational age range of delivery was 18 to 22 weeks.

In the operating room, 48.9% of patients were not dilated and 7.7% were less dilated (comprising the no-change group). A total of 29% of patients (53/182) were more dilated (comprising the change group); 10 cases (25%) in the physical-exam indicated group, 24 (32.4%) in the ultrasound-indicated, and 19 (23%) in the history indicated. Overall, differences in cervical dilation ranged from 0.5 cm to 2.0 cm. When comparing those with no change in dilation to those with a change in dilation, there was no difference in latency to delivery for all cerclages and for each of the cerclage indications. Table 2 shows this information with the interquartile ranges listed since this was not normally distributed data.

When considering only patients who had a dilated cervix in the office, a regression analysis showed that delivery occurred 3.0 weeks earlier for each centimeter dilation, ($p = 0.004$, R^2 13.3%). Similarly, for those with a dilated cervix after neuraxial anesthesia, delivery occurred 2.2 weeks earlier for each centimeter dilation ($p = 0.005$, R^2 8.2%). Overall, the odds of preterm birth were higher for those pregnant individuals with cervical dilation in the office (OR 1.6 [95% CI 1.01 to 2.5]), but not in the operating room (OR 1.4 [95% CI 0.9 to 2.0]).

Discussion

The purpose of this study is to evaluate if there is a difference in latency to delivery in women who have increased cervical dilation at the time of a cerclage. Compared to office examinations, the authors encountered many cases of women having increased cervical dilation at the time of cerclage

**Table 2:** Latency based on the change in dilation and no change in dilation based on the type of cerclage.

All cerclages (N = 182)	No change in dilation (n = 129)	Change in dilation (n = 53)	p value
GA at cerclage (w)	18 (14-21)	16 (14-20)	0.197
GA at delivery (w)	36 (32-39)	36 (29-39)	0.715
Latency (w)	17 (12-21)	16 (10-23)	0.985
PE Indicated Only (n = 40)	No change in dilation (n = 30)	Change in Dilation (n = 10)	p value
GA at cerclage (w)	21 (18-22)	19 (16-21)	0.346
GA at delivery (w)	36 (26-38)	33 (23-39)	0.842
Latency (w)	14 (7-18)	13 (6-17)	0.842
US Indicated Only (n = 74)	No change in dilation (n = 50)	Change in dilation (n = 24)	p value
GA at cerclage (w)	20 (18-22)	19 (16-21)	0.95
GA at delivery (w)	36 (32-37)	35 (28-37)	0.31
Latency (w)	15 (11-18)	14 (9-17)	0.56
History Indicated Only (n = 68)	No change in dilation (n = 49)	Change in Dilation (n = 19)	p value
GA at cerclage (w)	13 (12-13)	13 (12-13)	0.422
GA at delivery (w)	38 (32-39)	37 (35-39)	0.516
Latency (w)	23 (17-25)	24 (19-25)	0.296

Data presented as median (interquartile range) GA: Gestational Age; w: weeks; PE: Physical Exam; US: Ultrasound

placement. In this retrospective study of cerclage placement during pregnancy, 29% of patients have a change in cervical dilation after neuraxial anesthesia. This percentage change has not been previously documented in the literature. Despite this observed change in dilation, there is no difference in latency for those pregnancies with a change as compared to those without a change. Overall, the more dilated the cervix is in either setting, the earlier the gestational age at delivery.

Our study did not demonstrate a difference in latency to delivery based on increased cervical dilation after neuraxial anesthesia. However, we did not collect data on the administration of tocolysis and antibiotics if cervical dilation was encountered. Data support that latency between cerclage placement and delivery is increased when tocolytics and antibiotics are used at the time of a physical exam indicated cerclage [8]. Therefore it is not clear if this additional intervention improves latency if unanticipated cervical dilation is encountered. The study period included times before and after the adoption of using tocolytics and antibiotics for physically exam indicated cerclages. Changes in this practice pattern by different obstetricians during this study could have impacted the results on latency to delivery as well as the regression analysis. In fact, the large variation, R^2 , shown in the regression analysis indicates that there are factors other than cervical dilation and anesthesia administration that could impact delivery latency in individuals having a cerclage.

To our knowledge, this is the first study to evaluate the prevalence of a change in cervical dilation prior to and after neuraxial anesthesia for the placement of a cerclage. The authors hypothesized that the relaxation of the pelvis after neuraxial may result in an increase in dilation and that those with more dilation may differentially benefit from the placement of the cerclage. Ultimately, this study did not demonstrate a difference in latency based on a change in dilation. However, the study is limited by the inability to perform a sample size analysis as the true rate of cervical dilation was not known at the start of the study. Ultimately,

based on the rates of change in dilation our study was underpowered, especially for subgroup analysis.

The strengths of this study include a prolonged study time of obstetrical patients receiving care from the same institution with the same healthcare providers. Over this period our results are similar to previously published literature showing that cervical dilation is associated with an increased risk for an earlier delivery [9]. An additional strength of the study is that delivery outcomes, including neonatal loss rate and indication for delivery, are analyzed. This ensured that pregnancies that delivered at a perceivable or pre-viable gestation were included. Furthermore, all the individuals that were deemed eligible for cerclage placement had a cerclage placed in the operating room successfully without termination of the procedure by the primary surgeon due to inability to place the cerclage.

A large limitation of this study is interobserver variability, and 7.7% of patients had a decrease in cervical dilation documented. Additionally, there was no way to assess the timing between exams. Therefore, another hypothesis for the observation that 29% of patients have a change in cervical dilation can be because pelvic relaxation can allow for a more thorough exam or because of interobserver variability [10,11]. Small differences in cervical examination between providers, such as 0.5 cm, may not be clinically significant but were included in the change in the dilation group.

To address the limitations of the study presented above, it is recommended to do a prospective study on cervical dilation immediately before administration of anesthesia and immediately after anesthesia at the time of cerclage, to determine a direct change in dilation potentially associated with anesthesia. Any patients found to have new cervical dilation at this time would be administered prophylactic antibiotics and tocolytics for 24 hours. Latency to delivery would then be evaluated for all patients, including those with and without cervical change.



Conclusion

In conclusion, although 29% of pregnant individuals receiving a cerclage demonstrated a change in cervical dilation between the office and the operating room, there was no difference in latency based on this change. However, pregnant individuals with cervical dilation in either the office or operating room had an increased risk for an earlier delivery.

Conflict of interest

Author 4 receives funding from Meditem for a non-related research project

Condensation

Cervical dilation may be increased after administration of anesthesia for a cerclage, but this does not impact latency to delivery.

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