ORIGINAL ARTICLE

Eastern Journal of Medicine
East J Med 29(4): 535-544, 2024
DOI: 10.5505/ejm.2024.33678

The Effect of Cerclage Procedure Timing and Placental Localization on Pregnancy Outcomes In Pregnant Women Who Underwent Cervical Cerclage

Hüseyin Durukan[1], Yusuf Dal[2*]

[1]Department of Obstetrics and Gynecology, Mersin University Faculty of Medicine, Mersin, Turkey
[2]Department of Obstetrics and Gynecology, Perinatology Division, Mersin University Faculty of Medicine, Mersin, Turkey

ABSTRACT

This study aimed to determine whether an ideal week for cerclage treatment and placental location could affect pregnancy outcomes.

Eighty pregnant women who underwent cervical cerclage were included in the study. In the timing evaluation, the patients were divided into two groups according to the week of gestation at which the cerclage procedure was performed: Group 1 (11-18 weeks of gestation), and Group 2 (19-27 weeks of gestation). They were also divided into groups according to indication status: History group, Ultrasound group, and Examination group. Age, gravida, parity, previous second-trimester pregnancy loss status, previous preterm delivery, placenta localization, delivery before 28 weeks, delivery between 28-34 weeks, preterm delivery, term delivery, prolongation of the gestational week, length of hospitalization stay, the status of take home baby, neonatal outcomes were recorded and compared between groups.

In timing and indication groups, no statistically significant relationship was determined between the groups regarding delivery before 28 weeks of gestation, delivery between 28-34 weeks of gestation, preterm delivery, term delivery, and take home baby. There was a significant difference between the mean duration of prolongation of pregnancy and the mean duration of hospital stay (p value 0.001 for both). No significant effect of placental location on the prolongation of the gestational week and gestational age was observed. We observed that there is no optimal week for applying cerclage.

We determined that cerclage application can be performed in all working weeks within the indication and that placental placement will not change pregnancy outcomes.

Keywords: Cerclage, cervical insufficiency, placenta, timing

Introduction

One of the leading causes of neonatal morbidity and mortality is preterm birth (PTB) (1). Prematurity rises worldwide despite PTB reduction attempts. 10.6% of 2014 births were PTB (2). PTB has many maternal and fetal risk factors. Risk factors that may be associated with PTB include a history of PTB, previous second-trimester miscarriage, previous cervical procedures, shortened cervical length before or during pregnancy, and hypoplastic cervix due to intrauterine exposure to diethylstilbestrol (3, 4).

Cervical insufficiency (CI) causes 10% of PTBs, and some studies suggest that pregnant women with CI have a three-fold higher risk of PTB (5). Its incidence is estimated to be less than 1% of the obstetric population. However, the pathophysiology remains unclear. CI occurs when the uterine cervix cannot maintain pregnancy in the second trimester without clinical contractions or labor (6).

Cervical cerclage is a widely used intervention to prevent PTB and second-trimester pregnancy loss (STPL). It is known that cerclage application reduces preterm birth rates in patients with CI (7). Cervical cerclage can be classified as history-based, ultrasound-based, and physical examination-based cerclages (8). Contraindications are active preterm labor, presence of clinical chorioamnionitis, active vaginal bleeding, preterm premature rupture of the membranes (PPROM), fatal fetal anomaly, and fetal death (9).

The placenta has a significant role in fetal growth and development. Placental location is generally defined as fundal, anterior, posterior, lateral, low, and/or previa. The ability to evaluate the placental location by ultrasound has led researchers to

*Corresponding Author: Dr. Yusuf Dal, Department of Obstetrics and Gynecology, Perinatology Department, Mersin University Faculty of Medicine, TR-33110, Mersin, Turkey
E-mail: dryusufdal@gmail.com, Tel: +90 506 6756246
ORCID ID: Hüseyin Durukan: 0000-0001-5894-3421, Yusuf Dal: 0000-0001-7162-4644
Received: 10.12.2023, **Accepted:** 29.05.2024

determine whether the placental location is associated with adverse pregnancy complications. Placental locations other than previa have also been associated with some adverse antenatal, antepartum, postpartum, and neonatal outcomes (10, 11). Nevertheless, there are also studies in the literature stating that placental location is not associated with increased obstetric complications (12).

Prevention of PTB remains a challenge, and its treatment and prevention are vital to reduce neonatal mortality. PTB is a critical cause of anxiety, especially in those with a history of preterm birth. The patient group who can benefit from cerclage and the ideal cerclage application week in terms of efficacy and safety are still controversial. Moreover, the importance of placental location in pregnant women undergoing cerclage is unknown and as far as we know, there is no study in the literature. Therefore, the present study aimed to investigate the effect of cerclage application week and placenta location on pregnancy outcomes in pregnant women who underwent cerclage.

Material and Methods

Study Design: This study was conducted based on the electronic records of women with a history or diagnosis of SI who underwent cerclage between January 2012 and December 2022 in a tertiary hospital, according to a cross-sectional research design. The study was approved by the lochal ethics committee (Decision No. 2023/13) and informed consent was obtained from all participants.

All procedures performed in the current study involving human participants were in accordance with the ethical standards of the 1964 Helsinki Declaration and its later amendments in 2000.

Patient Selection: Pregnant women with a single live pregnancy who underwent cervical cerclage at 11-27 weeks of gestation were included in the study. Their medical records were complete, and informed consent for the operation was obtained from patients who underwent cervical cerclage. The cervical cerclage procedure was performed transvaginally using the McDonald technique by placing a Mersilene suture at the cervicovaginal junction without bladder mobilization under spinal anesthesia (13). Patients who met the inclusion criteria were grouped into two groups according to cerclage application week (timing groups) and indication (indication groups). Timing groups were divided into two groups those performed at 11-18 weeks of gestation (Group 1) and those performed at 19-27 weeks of gestation (Group 2). Indication groups were grouped into three as History-Indicated Cerclage (History group), Ultrasound Examination–Indicated Cerclage (Ultrasound group), and Physical Examination–Indicated Cerclage (Examination group). Patients with a history of one or more STPL or PTB due to painless cervical dilatation without labor or abruptio placentae were included in the history group (6). The ultrasound group consisted of patients with a history of STPL or PTB who underwent cerclage when the ultrasound-measured cervical length (CL) was 25 millimeters (mm) or less (6). Patients who underwent cerclage with advanced cervical dilatation in the absence of labor or placental abruption were also included in the examination group (6). Prophylactic antibiotics and vaginal progesterone were used in all patients. Exclusion criteria were multiple pregnancies, PPROM, vaginal bleeding, clinical signs of chorioamnionitis, cerclage due to previous cervical procedures, and patients who underwent cerclage but had an abortion or delivery other than spontaneous labor.

Data and Measurements: Basic data collected for analysis from electronic medical records were age, gravida, parity, previous STPL and PTB history, cerclage application week, CL measurement before cerclage, placental location, gestational week, prolongation in gestational age, number of days in hospital after cerclage, the status of take home baby, newborn delivery weight, and 1st and 5th minute APGAR scores. All CL measurements were made by transvaginal ultrasonography when the bladder was empty, according to standard recommended techniques. A clear sagittal view of the internal os, endocervical canal, and external os was obtained. Each examination was performed over approximately 3 minutes and the three shortest measurements were recorded. For the placental location, the uterus was imaged both transversely and sagittally. Placental locations were categorized as anterior, posterior, and fundal according to the location of at least 70-80% of the placenta.

Statistical Analysis: IBM SPSS Version 21 and MedCalc statistical package program were used to evaluate the data. The data was tested for normality using Kolmogorov-Smirnov, Shapiro-Wilk, and histograms. In the analysis of data, while continuous statistics were made, mean and standard deviation, median - Inter Quantile Range of the features were used, and frequency and

percentage values were used to define categorical variables. In comparing measurement values in two independent groups, the parametric test Student's t test statistics was used, and the Mann-Whitney U test statistics was used as a non-parametric test method. In comparing measurement values in three independent groups, the parametric test One Way ANOVA was used, and the non-parametric test was Kruskal Wallis H test statistics, and in case of a difference between the averages in group measurements, pairwise comparisons were evaluated with Tukey statistics. The chi-square test statistic was used to evaluate the relationship between categorical variables, and the z-test statistic was used to compare the rates between groups. Cut-off ROC (Area Under the Curve) Analysis was used to estimate the ideal week in the history group, and significance was determined by sensitivity, specificity, positive likelihood ratio, and negative likelihood ratio statistics. ROC curves and 95% Confidence Interval values are presented. For the area under the ROC curve (AUC), decision making for discriminative ability is excellent for 0.90-1, good for 0.80-0.90, fair for 0.70-0.80, fair for 0.60-0.70. was considered poor for 0.50-0.70 and unsuccessful for 0.50-0.70. 0.60. The statistical significance level of the data was accepted as $p<0.05$. A post hoc power analysis was performed using the G * Power 3.1 program (Dusseldorf, Germany). The study's α error probability, effect size, and study power were found to be 0.05, 0.5, and 0.95, respectively.

Results

A total of 80 pregnant women who underwent cervical cerclage were included in the study. The age of all patients ranged between 21 and 39 years. The mean age and deviation were 28.9±4.9, while the median value was 28.

When demographic and antenatal characteristics were evaluated in timing groups (Table 1), the groups were similar in terms of mean age ($p = 0.333$). There was a statistically significant difference between the CL averages between the groups ($p < 0.001$). While it was 27.83±8.69 mm in Group 1, it was less than 13.86±6.89 mm in Group 2. The groups were similar in terms of median parity ($p = 0.444$). There was a statistically significant difference between the groups in terms of STPL history ($p = 0.011$). There was no statistically significant difference between the groups in terms of placental localization ($p = 0.334$). There was a significant difference in the median gravida number between the groups ($p = 0.012$). While the gravida number was 3.6±1.6 in Group 1, it was lower in Group 2, 2.7±1.3. There was a significant difference between the medians of the previous STPL count between the groups ($p = 0.013$).

When demographic and antenatal characteristics were evaluated in the indication groups (Table 2), the groups were similar in terms of mean age, previous parity status, placental localization, median parity number, and median previous STPL number (p values 0.482, 0.292, 0.624, 0.163, and 0.112, respectively). The average week of cerclage application was 14.11±0.78 in the history group, 21±3.14 in the ultrasound group, and 21±2.12 in the examination group, and there was a significant difference between the averages of cerclage application weeks ($p < 0.001$). The mean CL was 29.46±7.41 mm in the history group, 16.16±4.18 mm in the ultrasound group, and 8.89±6.16 mm in the examination group. Differences in mean CL between all groups were significant ($p < 0.001$). There was a significant difference between the groups in terms of STPL history, and the statistically significant difference was between the history and ultrasound groups ($p < 0.001$). There was a statistically significant difference between the gravida number medians between the groups ($p < 0.001$).

Pregnancy outcomes in timing groups are given in Table 3. Between groups, birth before the 28th week of gestation, 28-34 weeks. There was no statistically significant relationship between birth, PTB, term birth, and taking a baby home between weeks of gestation (p values 0.574, 0.152, 0.524, 0.524, and 0.682, respectively). There was a significant difference between the groups in the average length of pregnancy ($p < 0.001$). While the prolongation of pregnancy was 20.5±5.7 weeks in Group 1, the miscarriage was 12.4±5.8 weeks in Group 2. There was also a significant difference in the average length of hospital stay between the groups ($p = 0.002$). While the hospital stay was 2.3±1.1 days in Group 1, it was 4.2±2.4 days in Group 2. There was no statistically significant difference between the newborn's birth weight and the average 1st and 5th minute APGAR scores (p values 0.212, 0.733, and 0.894, respectively).

Pregnancy outcomes in indication groups are listed in Table 4. Between groups, birth before the 28th week of gestation, 28-34 weeks. There was no statistically significant difference between birth, PTB, term birth, and take home baby between weeks of pregnancy (p values 0.424,

Table 1: Comparison of Demographic and Antenatal Characteristics In Timing Groups

	Timing groups		
	Group 1 (n=58)	Group 2 (n=22)	
	mean±SD	mean±SD	p-value
Age (years)	30.7±5.1	31.9±5.9	0.333*
Cerclage application week	14.44±1.26	22.00±2.27	0.001*
CL (mm)	27.83±8.69	13.86±6.89	0.001*
	n(%)	n(%)	
Parity			
No	21(36.2%)	10(45.5%)	0.451**
Yes	37(63.8%)	12(54.5%)	
STPL history			
No	14(24.1%)	12(54.5%)	0.011**
Yes	44(75.9%)	10(45,5%)	
Placental location			
Anterior	29(50%)	9(40.9%)	0.334**
Posterior	19(32.8%)	11(50%)	
Fundal	10(17.2%)	2(9.1%)	
	Median(IQR)	Median(IQR)	
Gravidity	4(1)	3(1.25)	0.012***
Parity	1(1)	1(1)	0.444***
Number of previous STPLs	2(1.75)	1(0.25)	0.013***

Abbreviations: CL: cervical length; mm: millimeter; STPL: second-trimester pregnancy loss; IQR: Inter Quartile Range; SD:Standard Deviation is significant at the p<0.05 level. *Student's t-test, **Chi-square test, ***Mann Whitney U test.

0.062, 0.593, 0.593, and 0.362, respectively). There was a significant difference between the groups in the average length of pregnancy ($p < 0.001$). The average length of pregnancy was 21.3±4.8 weeks in the history group, 13.9±5.9 weeks in the ultrasound group, and 10.1±6.6 weeks in the examination group. The differences in the mean length of pregnancy between the history group and the ultrasound and examination groups were significant ($p < 0.001$). There was a significant difference between the groups in terms of average hospital stay ($p < 0.001$). The differences in mean hospital stay between the history group and the ultrasound and examination groups were statistically significant ($p < 0.001$). There was a significant difference between the newborn birth weight averages between the groups ($p = 0.034$). The average birth weight was 2722.98±848.11 grams in the history group, 2386.84±1031.17 grams in the ultrasound group, and 1887.33±1064.59 grams in the examination group. The differences in birth weight averages between the history group and the examination group were significant ($p = 0.043$). The 1st and 5th minute APGAR scores averages were not significant between the groups (p values 0.583, and 0.443, respectively).

The placental location did not have a statistically significant effect on the prolongation of the gestational week and birth week in pregnant women who underwent cervical cerclage (p values 0.854, and 0.682, respectively) (Table 5).

Determination of cut-off at the week of cerclage application in the history group (Table 6), in the ROC analysis, in determining the cut-off at ≤ 14 weeks of gestation determined for the week of cerclage application, and term delivery for the meaningless cut-off of the test; sensitivity was 73.9%, specificity was % 34.48, insignificant diagnostic power was (Area under the curve) (AUC) 0.52 (95% Cl: 0.38-0.66, $p = 0.803$) (Figure 1), positive predictive value was 47.2%, and negative predictive value was 62.5%.

Discussion

PTBs continue to be major obstetric problems, and preterm births have increased worldwide. Prematurity increases neonatal mortality and

Table 2: Comparison of Demographic and Antenatal Characteristics In Indication Groups

	Indication groups				
	History group (n=52)	Ultrasound group (n=19)	Examination group (n=9)		
	mean±SD	mean±SD	mean±SD	p-value	p-value[a]
					1 vs. 2, 1 vs. 3, 2 vs. 3
Age (years)	30.7±4.9	31±5.8	33±6.1	0.482*	-
Cerclage application week	14.11±0.78	21±3.14	21±2.12	0.001*	0.001, 0.001, 0.991
CL (mm)	29.46±7.41	16.16±4.18	8.89±6.16	0.001*	0.001, 0.001, 0.034
	n(%)	n(%)	n(%)		
Parity					
No	17(32.7%)	10(52,6%)	4(44.4%)	0.292**	-
Yes	35(67.3%)	9(47.4%)	5(55.6%)		
STPL history					
No	9(17.3%)	13(68.4%)	4(44.4%)	0.001**	0.001, 0.062, 0.234
Yes	43(82.7%)	6(31.6%)	5(55.6%)		
Placental location					
Anterior	27(51.9%)	6(31.6%)	5(55.6%)	0.624**	-
Posterior	18(34.6%)	9(47.4%)	3(33.3%)		
Fundal	7(13.5%)	4(21.1%)	1(11.1%)		
	Median(IQR)	Median(IQR)	Median(IQR)		
Gravidity	4(1)	3(2)	5(2.5)	0.001***	0.001, 0.39, 0.35
Parity	1(1)	1(1)	2(1.5)	0.163***	-
Number of previous STPLs	2(1)	1(1.25)	1(0.50)	0.112***	-

Abbreviations: CL: cervical length; mm;milimeter; STPL: second-trimester pregnancy loss; IQR: Inter Quartile Range; SD:Standard Deviation is significant at the $p<0.05$ level. *One Way ANOVA, *Chi-square test, ***Kruskal Wallis H test, [a]Post Hoc Test |Tukey, z test.

morbidity. PTBs affect families and economies. Various methods are used to prevent and treat PTB. PTB prevention with cervical cerclage is common today. However, cerclage does not provide pregnancy outcomes for all women. Different weeks of pregnancy or cerclage indications may affect the results. Several studies have associated placental position with obstetric diseases. The literature research found no study on placental position and cerclage pregnancy outcomes. Thus, this study examined how cerclage application week and placental positioning affect pregnancy outcomes. Cerclage is successful in all working weeks within the indication, and placental location doesn't affect pregnancy outcomes, according to our study.

In our study, timing and indication groups had similar delivery and neonatal outcomes. Before 28, 28-34 weeks, PTB, term birth, take home baby, and APGAR scores did not differ by timing or indication. No clear affect of time or indication on pregnancy outcomes. A study comparing elective and emergency cerclages found similar results. It was observed that there was no difference between the two groups in terms of the mean week of birth, the birth rate between 24 and 28 weeks, the birth rate after 34 weeks, or the term birth rate (14). In the study of Atçı et al., similar

Table 3: Comparison of Pregnancy Outcomes In Timing Groups

	Timing groups		
	Group 1 (n=58)	Group 2 (n=22)	
	n(%)	n(%)	p-value
Birth before < 28th gestational week			
No	50(86.2%)	20(90.9%)	0.574*
Yes	8(13.8%)	2(9.1%)	
Birth at 28th-34th gestational week			
No	52(89.7%)	17(77.3%)	0.152*
Yes	6(10.3%)	5(22.7%)	
PTB			
No	31(53.4%)	10(45.5%)	0.524*
Yes	27(46.6%)	12(54.5%)	
Term birth			
No	27(46.6%)	12(54.5%)	0.524*
Yes	31(53.4%)	10(45.5%)	
Take home baby			
No	6(10.3%)	3(13.6%)	0.682*
Yes	52(89.7%)	19(86.4%)	
	mean±SD	mean±SD	
Prolongation of gestation period (weeks)	20.5±5.7	12.4±5.8	0.001**
Length of stay in hospital (days)	2.3±1.1	4.2±2.4	0.002**
Birth weight (grams)	2631.67±930.18	2331.54±979.51	0.212**
APGAR 1st minute	6.8±1.8	6.7±2.2	0.733**
APGAR 5th minute	8.3±1.5	8.3±1.8	0.894**

Abbreviations: PTB: preterm birth. SD: Standard Deviation is significant at the p<0.05 level. *Chi-square test, **Student's t test.

results were found (15). Although the indication or timing did not change the birth and newborn outcomes, it was determined that the birth rates before 28 weeks and between 28-34 weeks of gestation in patients who underwent cerclage were low in all groups, and the rate of take home baby was high. The rates of preterm and term delivery after 34 weeks of gestation were close to each other in patients who underwent cerclage. In the study of Huang et al., the rate of PTB at <28 (2%) and <34 gestational week (36%) in the cerclage group was significantly lower than the 31.7% and 58.5% observed in the non-cerclage group. There was no significant difference in PTB or spontaneous PTB rate at <37 gestational weeks, APGAR scores, and neonatal complications (16). The study of He et al. obtained similar results compared to ours regarding PTB rates (17).

The prolongation in pregnancy and hospital stay after cerclage are affected by the week or indication of cerclage application, and when cerclage is performed before the 18th gestation week or with a history indication, prolongation in pregnancy duration is more prominent and hospital stay is shorter. Cerclages performed before the 18th gestational week are usually performed with an indication of the history, leading to this result. Another study revealed that the hospital stay was shorter in cerclages performed before the 18th gestational week or for elective indications (17). The prolongation of the pregnancy period is critical in terms of efficiency in cerclages with ultrasound and examination indications, which are called emergencies. In ultrasound-indicated cerclages, our average cerclage application week was 24 weeks of gestation, in cerclages with examination indications, the average cerclage application week was 23 weeks, and the average length of pregnancy was 11 weeks. Effective prolongation of the gestation period is especially crucial in improving newborn outcomes. Althuisius et al. demonstrated

Table 4: Comparison of Pregnancy Outcomes In Indication Groups

	Indication groups				
	History group (n=52)	Ultrasound group (n=19)	Examination group (n=9)	p-value	p-value[a] 1 vs. 2, 1 vs. 3, 2 vs. 3
	n(%)	n(%)	n(%)		
Birth before < 28th gestational week					
No	45(86.5%)	18(94.7%)	7(77.8%)	0.424*	-
Yes	7(13.5%)	1(5.3%)	2(22.2%)		
Birth at 28th-34th gestational week					
No	48(92.3%)	15(78.9%)	6(66.7%)	0.062*	-
Yes	4(7.7%)	4(21.1%)	3(33.3%)		
PTB					
No	29(55.8%)	8(42.1%)	4(44.4%)	0.593*	-
Yes	23(44.2%)	11(57.9%)	5(55.6%)		
Term birth					
No	23(44.2%)	11(57.9%)	5(55.6%)	0.593*	-
Yes	29(55.8%)	8(42.1%)	4(44.4%)		
Take home baby					
No	4(7.7%)	3(15.8%)	2(22.2%)	0.362*	-
Yes	48(92.3%)	16(84.2%)	7(77.8%)		
	mean±SD	mean±SD	mean±SD		
Prolongation of gestation period (weeks)	21.3±4.8	13.9±5.9	10.1±6.6	0.001**	0.001, 0.001, 0.172
Length of stay in hospital (days)	2.2±0.7	4.0±2.6	4.4±1.7	0.001**	0.001, 0.001, 0.742
Birth weight (grams)	2722.98±848.11	2386.84±1031.17	1887.33±1064.59	0.034**	0.362, 0.043, 0.384
APGAR 1st minute	6.75±2.04	6.8±1.9	6.1±2.5	0.583**	-
APGAR 5th minute	8.23±1.89	8.4±1.5	7.6±2.4	0.443**	-

Abbreviations: PTB: preterm birth. SD:Standard Deviation is significant at the $p<0.05$ level. *Chi-square test, **One Way ANOVA test, [a] Post Hoc Test | Tukey.

that pregnancies were prolonged by four weeks with physical examination-indicated cerclage (18), and other studies supported this efficacy (19, 20). Our study determined a significant prolongation of the gestational period when the cerclage application week was less than the 18th week of pregnancy or when cerclage was performed with the indication of the history. However, in the study of He et al., no significant effect was observed on the prolongation of the gestational period according to timing or indication (17).

The main purpose of cerclage is to prolong the gestation period and as a result, increase the rate of take home baby. The present study determined the rate of take home baby as 88.8% in all patient groups who underwent cerclage. In the study of Frenken et al., the rate of take home baby after cerclage was high. It was concluded that it has a higher rate, especially when it is performed by experienced gynecologists (21). In the study of Bayrak et al., who underwent emergency cerclage due to cervical dilatation and prolapsed fetal membrane, the rate of take home baby in the cerclage group was statistically significant at 63% (22).

Table 5: Evaluation of Difference In Gestational Week and Gestational Age According To Placenta Location

	Placental location				
	Anterior (n=38)	Posterior (n=30)	Fundal (n=12)	p-value	p-valuea 1 vs. 2, 1 vs. 3, 2 vs. 3
	mean±SD	mean±SD	mean±SD		
Birth week	34.4±4.9	35.2±4.2	33.8±8.3	0.682*	-
Prolongation of gestation (weeks)	18.3±6.6	18.1±6.3	19.5±8.9	0.854*	-

SD:Standard Deviation is significant at the p<0.05 level. *One Way ANOVA test, ªPost Hoc Test |Tukey.

Table 6: Determination of Cut-Off In The Week of Cerclage Application In The History Group

Cerclage application week	AUC	Cut-off	Sensitivity (%)	Specificity%	AUC 95%CI	p-value	PPV %	NPV%
PTB=23 Term birth=29	0.52	≤14	73.92	34.48	0.38-0.66	0.803	47.21	62.54

Abbreviations: PTB: preterm birth; AUC: Area Under the Curve; CI: Confidence Interval; PPV: positive predictive value; NPV: negative predictive value.

The placenta plays a vital role in fetal growth and development. Placental implantation occurs in the upper part of the uterus, approximately seven days after conception. In a study on placental location in 74.087 women, placental localizations were reported as anterior placenta in 47.8%, posterior placenta in 46.4%, fundal placenta in 3.3%, and lateral placenta in 2.5% (23). In the literature, there are studies on placental location and pregnancy complications. Fundal and lateral placental locations were associated with adverse outcomes compared to posterior placental locations, including PTB, PPROM, and low birth weight delivery. The lateral placental location has been associated with an increased risk of preeclampsia (23). In two different studies in the literature, a significant relationship was determined between the lateral placenta and PTB (23, 24). However, in a meta-analysis evaluating the results of two studies evaluating the risk of PTB for central, fundal, and lateral placentas, no conclusion was reached for these localities (12). There are studies in the literature evaluating pregnancy outcomes in patients with a low-localized placenta and undergoing cerclage. The common result of three studies comparing cerclage and waiting for management in women with a low placenta and PTB risk was in favor of cerclage for prolongation of the gestational period (25-27). However, there is no data on other placental locations in the literature, and our study is the first study in this area to the best of our knowledge. In our study, we concluded that the location of the placenta did not have any significant effect on the prolongation of the gestational week and gestational age in women who underwent cerclage.

Regarding the timing of cerclage application, all guidelines agree that cerclage should typically be performed at 12 to 14 weeks of gestation for history indication (6, 9, 28). Cerclage application is not accepted at very early weeks, since fetal abnormalities cannot be completely excluded and surgical intervention may trigger pregnancy loss because the placenta is not yet stable (29). In the late stages of pregnancy, the uterine volume expands, the uterus rises into the abdominal cavity, and the cervix shortens, which increases the risk of surgery and may cause PPROM or contractions (30). There is not enough data in the literature about the optimal timing for cerclage application. In one study, the early group between 14 and 18 weeks of gestation and the middle group between 19 and 27 weeks of gestation were determined. They reported that treatment with cervical cerclage at 14 to 18 weeks of pregnancy significantly increased the success rate of the intervention and effectively reduced intraoperative bleeding and shortened hospital stay (17). In our study, the ideal week of gestation for cerclage application was investigated, and there was no statistically significant difference between the weeks of cerclage.

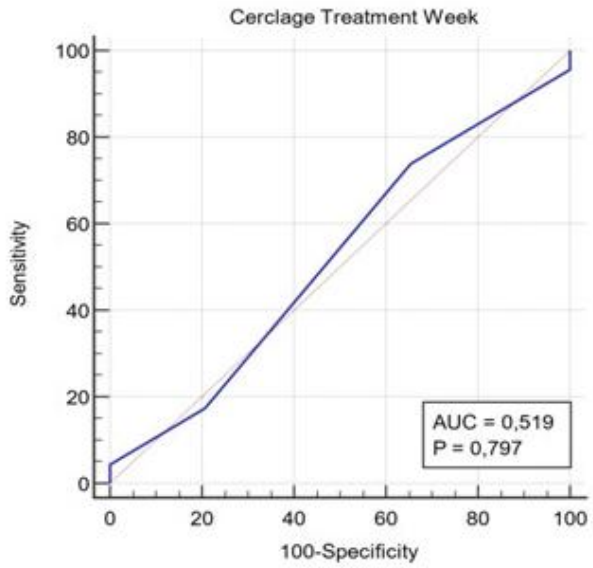

Fig. 1. ROC Curve in the cerclage application week in the history group. Determination of the cut-off for the optimal gestational week in achieving term delivery in pregnant women who underwent cerclage in the history group

The limitations of our study were its retrospective design, single-center design, small sample size, and inability to compare with pregnant women who did not undergo cerclage. Conducting the study in a tertiary center and selecting higher-risk pregnancies to be included in the study were the strengths of the study. Another strength was that it was the only surgical procedure for cerclage.

In conclusion, we have not determined a suitable time for the cerclage application within the application weeks. The small sample size, the lack of clear views on cerclage, and the many factors that trigger PTB may have contributed to the inability to find an optimal week. We revealed that placental location did not affect the prolongation of the gestational week and gestational age. The effect may be uncertain, as there is no official classification of placenta location other than placenta previa. However, it may be useful to conduct large-scale prospective studies including other possible risk factors to confirm these results.

Author Contributions: HD: Analysis and interpretation, design, statistical analysis, audit, concept. YD: Concept, author, design, data collection, data processing, analysis, and interpretation. All authors approved the final version of the manuscript.

Conflict of Interest: There is no conflict of interest between the authors.

Funding: The authors have not disclosed any funding.

References

1. Liu L, Oza S, Hogan D, Perin J, Rudan I, Lawn JE, et al. Global, regional, and national causes of child mortality in 2000–13, with projections to inform post-2015 priorities: an updated systematic analysis. The lancet. 2015;385(9966):430-40.
2. Chawanpaiboon S, Vogel JP, Moller A-B, Lumbiganon P, Petzold M, Hogan D, et al. Global, regional, and national estimates of levels of preterm birth in 2014: a systematic review and modelling analysis. The Lancet Global Health. 2019;7(1):e37-e46.
3. Simoens C, Goffin F, Simon P, Barlow P, Antoine J, Foidart JM, et al. Adverse obstetrical outcomes after treatment of precancerous cervical lesions: a Belgian multicentre study. BJOG: An International Journal of Obstetrics & Gynaecology. 2012;119(10):1247-55.
4. Koullali B, Oudijk M, Nijman T, Mol B, Pajkrt E, editors. Risk assessment and management to prevent preterm birth. Seminars in fetal and neonatal medicine; 2016: Elsevier.
5. Bloomfield J, Pénager C, Mandelbrot L. Shirodkar cerclage: obstetrical and neonatal outcomes in a single-center cohort of 55 cases. Journal of Gynecology Obstetrics and Human Reproduction. 2021;50(9):102152.
6. ACOG Practice Bulletin No.142: Cerclage for the management of cervical insufficiency. Obstet Gynecol. 2014;123(2 Pt 1):372-9.
7. Chen R, Huang X, Li B. Pregnancy outcomes and factors affecting the clinical effects of cervical cerclage when used for different indications: A retrospective study of 326 cases. Taiwan J Obstet Gynecol. 2020;59(1):28-33.
8. Alfirevic Z, Stampalija T, Medley N. Cervical stitch (cerclage) for preventing preterm birth in singleton pregnancy. Cochrane Database Syst Rev. 2017;6(6):Cd008991.
9. Shennan A, To M. Green-top guideline No 60: cervical cerclage. London: RCOG. 2011.
10. Fidan U, Ulubay M, Bodur S, Ferdi Kinci M, Emre Karaşahi NK, Cemal Yenen M. The effect of anatomical placental location on the third stage of labor. Clin Anat. 2017;30(4):508-11.
11. Seckin KD, Cakmak B, Karsli MF, Yeral MI, Gultekin IB, Oz M, et al. Is lateral localisation of placenta a risk factor for adverse perinatal outcomes? J Obstet Gynaecol. 2015;35(7):696-8.

12. Racher ML, Morris M, Scott AP, Ounpraseuth ST, Hu Z, Whittington JR, et al. Placental location site and adverse antepartum pregnancy complications: a meta-analysis and review of the literature. Arch Gynecol Obstet. 2022;305(5):1265-77.
13. McDONALD IA. Suture of the cervix for inevitable miscarriage. Obstetrical & Gynecological Survey. 1957;12(5):673-4.
14. Gluck O, Mizrachi Y, Ginath S, Bar J, Sagiv R. Obstetrical outcomes of emergency compared with elective cervical cerclage. The Journal of Maternal-Fetal & Neonatal Medicine. 2017;30(14):1650-4.
15. Atcı AA, Doğru Ş, Akkuş F, Akıncı D, Acar A. Mid-trimester cerclage outcomes in singleton and twin pregnancies: a single tertiary center experience. Perinatal Journal. 2023;31(1):58-65-58-65.
16. Huang X, Chen R, Li B. Analysis of maternal and neonatal outcomes using cervical cerclage or conservative treatment in singleton gestations with a sonographic short cervix. Medicine. 2021;100(18).
17. He D, Zhao D. Analysis of the Timing of Cervical Cerclage Treatment in Pregnant Women with Cervical Insufficiency and the Effect on Pregnancy Outcome. Emergency Medicine International. 2022;2022.
18. Althuisius SM, Dekker GA, Hummel P, van Geijn HP. Cervical incompetence prevention randomized cerclage trial: emergency cerclage with bed rest versus bed rest alone. Am J Obstet Gynecol. 2003;189(4):907-10.
19. Daskalakis G, Papantoniou N, Mesogitis S, Antsaklis A. Management of cervical insufficiency and bulging fetal membranes. Obstetrics & Gynecology. 2006;107(2 Part 1):221-6.
20. Stupin JH, David M, Siedentopf J-P, Dudenhausen JW. Emergency cerclage versus bed rest for amniotic sac prolapse before 27 gestational weeks: a retrospective, comparative study of 161 women. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2008;139(1):32-7.
21. Frenken MWE, Goossens S, Janssen MCR, Mulders LGM, Laar J. Cervical cerclage for prevention of preterm birth: the results from A 20-year cohort. J Obstet Gynaecol. 2022;42(7):2665-71.
22. Bayrak M, Gul A, Goynumer G. Rescue cerclage when foetal membranes prolapse into the vagina. J Obstet Gynaecol. 2017;37(4):471-5.
23. Granfors M, Stephansson O, Endler M, Jonsson M, Sandström A, Wikström AK. Placental location and pregnancy outcomes in nulliparous women: A population-based cohort study. Acta Obstet Gynecol Scand. 2019;98(8):988-96.
24. Doctory N, Romano A, Navon I, Barbash-Hazan S, Bardin R, Hadar E. Placental location and obstetrical-neonatal outcomes: A retrospective study. Int J Gynaecol Obstet. 2023;160(2):641-5.
25. Arias F. Cervical cerclage for the temporary treatment of patients with placenta previa. Obstet Gynecol. 1988;71(4):545-8.
26. Cobo E, Conde-Agudelo A, Delgado J, Canaval H, Congote A. Cervical cerclage: an alternative for the management of placenta previa? Am J Obstet Gynecol. 1998;179(1):122-5.
27. Jaswal A, Manaktala U, Sharma JB. Cervical cerclage in expectant management of placenta previa. Int J Gynaecol Obstet. 2006;93(1):51-2.
28. Alsulmi E, Schneider C. Cervical insufficiency and cervical cerclage. J Obstet Gynaecol Can. 2014;36(10):862.
29. Serra V. Need to define and validate an early pregnancy loss screening strategy. Fertil Steril. 2018;109(1):64-6.
30. Son GH, Lee JJ, Kim Y, Lee KY. The Role of Antimicrobial Peptides in Preterm Birth. Int J Mol Sci. 2021;22(16).