

Comparison of perinatal outcomes following emergency cervical cerclage with and without prolapsed fetal membranes

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ABSTRACT

Aims: This study aimed to compare the perinatal outcomes of singleton pregnancies undergoing emergency cervical cerclage (ECC) indicated by physical examination, based on the presence or absence of prolapsed fetal membranes.

Methods: In this retrospective cohort study, a total of 80 singleton pregnancies that underwent ECC due to cervical insufficiency between April 2023 and April 2025 were analyzed. Patients were divided into two groups according to whether prolapsed fetal membranes were observed during speculum examination: the prolapsed group (n=35) and the non-prolapsed group (n=45). Maternal demographic characteristics, laboratory parameters, as well as obstetric and neonatal outcomes, were compared between the groups. Appropriate parametric or non-parametric tests were used for statistical analyses. A binary logistic regression analysis was performed to identify independent predictors of NICU admission.

Results: The two groups were comparable regarding maternal age, body-mass index (BMI), and parity ($p>0.05$). Inflammatory parameters showed significant differences: the prolapsed group had higher white blood cell and neutrophil counts, as well as elevated CRP levels (all $p<0.05$). Regarding cerclage-related findings, baseline cervical dilation and effacement were greater in the prolapsed group, and cervical length after cerclage was significantly shorter. In addition, the latency period was shorter in the prolapsed group (median 34 vs. 92 days, $p<0.001$). Neonatal outcomes also differed substantially: gestational age at delivery (median 26+5 vs. 33+2 weeks) and birthweight (mean 1752 g vs. 2635 g) were lower in the prolapsed group, while NICU admission (68.6% vs. 35.6%), need for mechanical ventilation (28.6% vs. 6.7%), and low 5-minute Apgar scores were significantly higher (all $p<0.01$). In binary logistic regression analysis, the presence of prolapsed membranes, elevated CRP levels, and low 5-minute Apgar score were identified as independent predictors of NICU admission.

Conclusion: In ECC cases with prolapsed fetal membranes, gestational age and birth weight are lower, latency period is shorter, and neonatal morbidity and NICU admission are higher. These findings suggest that the effectiveness of ECC may be limited in cases of advanced cervical insufficiency with membrane prolapse, and that treatment strategies should be individualized accordingly.

Keywords: Cervical cerclage, cervical insufficiency, preterm birth, fetal membrane prolapse, neonatal intensive care

INTRODUCTION

Preterm birth remains one of the leading causes of neonatal morbidity and mortality worldwide. In particular, extremely preterm deliveries occurring before the 28th week of gestation are associated with severe short- and long-term health complications.¹ Among the multifactorial etiologies of preterm birth, cervical insufficiency—characterized by painless cervical shortening and dilation during the second trimester—stands out as a major cause of spontaneous preterm deliveries and mid-trimester pregnancy losses.^{2,3}

Cervical insufficiency affects approximately 1% of all pregnancies and can be diagnosed in up to 8% of women with recurrent second-trimester losses.¹ Key contributing factors include previous cervical surgical procedures (e.g., conization), subclinical infectious/inflammatory processes, rapid cervical

dilation, and congenital connective tissue disorders.^{1,4} Diagnosis is typically based on obstetric history or cervical shortening detected via transvaginal ultrasonography. The treatment approach is shaped by these determinants.⁵

Cervical cerclage is a surgical procedure involving the placement of a suture in the cervical canal to provide mechanical support to the cervix. It has been one of the principal interventions for preventing preterm birth for nearly seventy years.⁶ Cerclage may be performed based on obstetric history (history-indicated), ultrasound findings (ultrasound-indicated), or when physical examination reveals cervical dilation and/or prolapsed fetal membranes (physical examination-indicated).^{5,7} While the efficacy of cerclage based on history or ultrasound findings may be limited in

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certain patient populations, cerclage performed based on physical examination has been suggested to offer significant benefits in selected cases.^{2,8}

Patients undergoing physical examination–indicated cerclage often present with advanced cervical dilation, effacement, or prolapsed fetal membranes. These conditions reduce the success rate of the surgical intervention and increase the risk of complications such as infection, prelabor rupture of membranes (PROM), and chorioamnionitis.^{3,9} However, studies evaluating the efficacy of cerclage in this high-risk population are quite limited. In particular, data comparing perinatal outcomes between cases with and without prolapsed membranes are insufficient.

In this context, our study aimed to compare the perinatal outcomes of pregnant women who underwent emergency cerclage based on physical examination, by stratifying them into two groups according to the presence or absence of prolapsed fetal membranes. We anticipate that this study will fill an important gap in the literature concerning the effectiveness and safety of cerclage in cases with advanced cervical changes and membrane prolapse.

METHODS

The study was approved by the Scientific Researches Ethics Committee of Bursa City Hospital (Date: 09.04.2025, Decision No: 2025-7/12), and all patient data were anonymized prior to analysis. The research was conducted in accordance with the ethical principles of the Declaration of Helsinki.

This retrospective cross-sectional study was conducted between April 2023 and April 2025 in the perinatology department of a tertiary education and research hospital. A total of 80 singleton pregnancies that underwent emergency cervical cerclage (ECC) based on physical examination and had completed perinatal follow-up were included in the study.

Emergency cerclage based on physical examination was performed in cases with cervical dilation ≥ 2 cm, cervical effacement $\geq 60\%$, or the presence of prolapsed amniotic membranes. Prior to pre-cerclage speculum examination, bladder emptying was routinely performed. During the examination, patients were divided into two groups according to whether the amniotic membranes were prolapsed through the cervical canal into the vagina. Membrane prolapse was defined as ballooning of the amniotic sac beyond the cervical os and into the vaginal canal. Patients exhibiting this finding were classified as the “prolapsed” group, while those without it were assigned to the “non-prolapsed” group. Baseline cervical dilation (in centimeters) and effacement rates (%) were recorded for all patients prior to cerclage placement.

All patients were evaluated prior to cerclage for uterine contractions, fever, membrane rupture, vaginal bleeding, chorioamnionitis, placental abruption, and fetal distress. Vaginal and urine cultures were obtained, and appropriate antibiotic therapy was initiated for those with positive culture results.

The cerclage procedures were performed under general anesthesia by experienced physicians in the perinatology unit

of the hospital, using the McDonald technique in accordance with the standard protocol. During the procedure, patients were placed in the lithotomy position, and a 5-mm-thick braided polyester suture (Mersilene®, 40 cm) was circumferentially placed around the cervix. In accordance with our institutional practice, all patients received a prophylactic dose of 1 gram of intravenous cefazolin during the surgery, although we acknowledge that there is no universal consensus on routine antibiotic prophylaxis following cerclage. Indomethacin was not administered to any of the patients after the procedure. After discharge, all patients were started on intravaginal progesterone therapy. For ongoing pregnancies, the cerclage was routinely removed at 37 weeks of gestation.

Exclusion criteria for the study included chronic maternal diseases such as cardiac disorders and thyroid dysfunction, smoking or alcohol use, congenital fetal anomalies, multiple pregnancies, and incomplete medical records. Cerclage was not performed in pregnancies beyond 24 weeks of gestation; additionally, patients who delivered within the first 48 hours after cerclage were excluded from the study.

Demographic characteristics and obstetric histories of the patients (including maternal age, BMI, gravida, parity, progesterone use, and history of recurrent pregnancy loss [defined as two or more consecutive pregnancy losses before 20 weeks of gestation]) were obtained from the hospital information system. In patients receiving progesterone therapy, the indication for treatment was either a history of spontaneous preterm birth or a short cervical length (< 25 mm) detected during the current pregnancy. These patients were followed with serial transvaginal cervical length measurements at 2-week intervals until 24 weeks of gestation, in accordance with our institutional protocol. Venous blood samples collected prior to cerclage were analyzed for hemoglobin, white blood cell (WBC) count, and C-reactive protein (CRP) levels. These biomarkers were selected to assess maternal inflammation and potential infectious processes.

During obstetric follow-up, cervical length before cerclage, gestational week at cerclage placement, length of hospital stay, duration of antibiotic therapy, latency period (time to delivery), and gestational week at delivery were systematically recorded. The latency period was defined as the number of days between the cerclage procedure and the date of delivery and was considered a critical indicator reflecting the course of pregnancy.

For neonatal outcomes, the mode of delivery, birth weight, 1st- and 5th-minute Apgar scores, neonatal intensive care unit (NICU) admission status, and any neonatal morbidities (e.g., respiratory distress syndrome [RDS], need for mechanical ventilation, etc.) were recorded.

A post hoc power analysis was conducted based on the available sample size, as no a priori calculation had been performed. Assuming a medium effect size (Cohen's $d=0.5$), a significance level of 5% ($\alpha=0.05$), and a statistical power of 80% ($1-\beta=0.80$), the required total sample size was calculated to be 64 (approximately 32 subjects per group) for comparisons between the prolapsed and non-prolapsed membrane groups. The total of 80 patients included in this study (prolapsed:

n=35; non-prolapsed: n=45) meets this requirement and provides sufficient statistical power to detect moderate clinical differences. The power analysis was performed using the G*power software version 3.1.9.7.

Statistical Analysis

The data analyses were conducted using IBM SPSS Statistics for Windows, version 22.0 (IBM Corp., Armonk, NY, USA). The normality of distribution for continuous variables was assessed using the Kolmogorov–Smirnov test. Data with normal distribution were presented as “mean±standard deviation,” while non-normally distributed data were expressed as “median (25th–75th percentile range)” [IQR]. Categorical variables were described using frequency and percentage (%).

For comparisons between the two groups, the independent Samples t-test or Mann–Whitney U test was used for continuous variables depending on the distribution, and the Chi-square test or Fisher’s exact test was applied for categorical variables, as appropriate. A binary logistic regression analysis was performed to identify independent predictors of NICU admission. Continuous variables such as gestational age at delivery (weeks), latency period (days), and CRP levels (mg/L) were entered into the regression model without predetermined cut-off values. A p-value of <0.05 was considered statistically significant for all analyses.

RESULTS

A total of 80 pregnant women who underwent ECC based on physical examination indication were included in the study. Patients were divided into two groups according to the presence or absence of prolapsed amniotic membranes on pre-cerclage speculum examination: the prolapsed group (n=35) and the non-prolapsed group (n=45).

The proportion of patients with a history of recurrent pregnancy loss was 20.0% (n=7) in the prolapsed membrane group and 8.9% (n=4) in the non-prolapsed membrane group, with no statistically significant difference between the groups (p=0.182). The mean cervical dilation before cerclage was 3.2±0.8 cm in the prolapsed membrane group and 2.1±0.7 cm in the non-prolapsed membrane group (p<0.001). The mean cervical effacement rates were 78±12% vs. 62±15% for the prolapsed and non-prolapsed groups, respectively (p<0.001). Advanced cervical dilation (≥3 cm) was observed in 51.4% (n=18) of patients in the prolapsed group and 13.3% (n=6) in the non-prolapsed group (p<0.001). The two groups were comparable in terms of age, BMI, weight gain during pregnancy, parity, and progesterone use (p>0.05). However, the number of gravida was significantly higher in the prolapsed group (p=0.021). Among the laboratory parameters, WBC, lymphocyte, neutrophil, and CRP levels were significantly higher in the prolapsed group (p=0.008, p=0.046, p=0.031, and p=0.016, respectively), indicating a more pronounced systemic inflammatory state (Table 1).

Cervical length was significantly shorter in the prolapsed group both before (p=0.003) and after cerclage placement (p=0.006). In addition, patients in this group had a significantly longer hospital stay after cerclage (p<0.001)

Table 1. Comparison of demographic, clinical and laboratory parameters between patients with and without prolapsed membranes who underwent emergency cervical cerclage

Variable	Prolapsed membranes (+) (n=35)	Prolapsed membranes (-) (n=45)	p-value
Age (years) †	29.8±5.5	28.7±5.3	0.428 ¹
BMI (kg/m ²) †	30.9±5.8	30.2±6.1	0.596 ¹
Weight gain during pregnancy (kg) *	10 (3–20)	10 (2–25)	0.833 ²
Gravida*	3 (1–8)	2 (1–6)	0.021 ²
Parity*	1 (0–3)	1 (0–2)	0.308 ²
Progesterone usage (%)	19 (54.3%)	28 (62.2%)	0.457 ³
History of recurrent pregnancy loss	7 (20%)	4 (8.9%)	0.182 ⁴
Hemoglobin (g/dl) †	11.7±1.2	12.1±1.0	0.073 ¹
WBC (10 ⁹ /L) †	11.5±3.1	9.8±2.2	0.008 ¹
Lymphocyte count (10 ⁹ /L) †	2.6±1.9	1.9±0.6	0.046 ¹
Neutrophil count (10 ⁹ /L) †	8.3±3.0	7.1±2.0	0.031 ¹
CRP (mg/L) †	14.6±17.8	7.2±8.4	0.016 ¹
Cervical length before cerclage (mm) †	8.5±5.9	12.3±4.6	0.003 ¹
Cerclage week*	21 (14+1–24+5)	20+5 (13+2–24+6)	0.265 ²
Cervical length after cerclage (mm) †	16.1±10.2	21.9±6.8	0.006 ¹
Cervical dilation before cerclage (cm) †	3.2±0.8	2.1±0.7	<0.001 ¹
Cervical effacement before cerclage(%) †	78±12	62±15	<0.001 ¹
Advanced cervical dilation ≥3 cm (%)	18 (51.4%)	6 (13.3%)	<0.001 ³
Hospitalization after cerclage (days) *	5 (2–14)	2 (1–5)	<0.001 ²
Antibiotic use duration (days) *	3 (0–14)	0 (0–3)	0.012 ²
Gestational week at delivery*	26+5 (20+1–38+4)	33+2 (27+3–40)	<0.001 ²
Latency (days) *	34 (5–167)	92 (28–185)	<0.001 ²
Clinical chorioamnionitis	2 (5.7%)	0 (0%)	0.154 ²
Postpartum hemorrhage	1 (2.9%)	1 (2.2%)	1.000 ²

Data are presented as mean±standard deviation (†), number (%), percentage), or median (*[IQR: Interquartile range], where appropriate. p<0.05 was considered statistically significant. ¹: Student’s t-test, ²: Mann–Whitney U test, ³: Chi-square test 4: Fisher’s exact test. BMI: Body-mass index, WBC: White blood count, CRP: C-reactive protein

and required longer antibiotic therapy (p=0.012). The mean gestational age at delivery was also significantly earlier in the prolapsed group (p<0.001). The latency period was markedly shorter in this group as well (p<0.001). These differences are also visually demonstrated in the boxplots shown in Figure 1.

There were no statistically significant differences between the two groups in terms of the incidence of complications such as gestational diabetes, fetal growth restriction (FGR), intrahepatic cholestasis, postpartum hemorrhage, and hypertensive disorders. However, clinical chorioamnionitis was observed only in the prolapsed group (n=2, 5.7%) (p=0.154); when considered alongside elevated inflammatory markers, this finding may be noteworthy (Table 1).

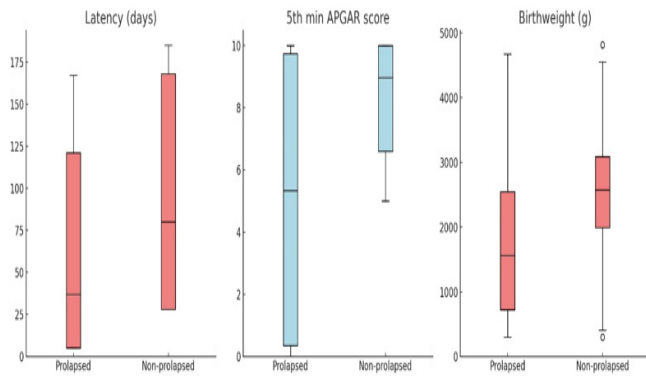


Figure 1. Boxplot comparison of latency to delivery, 5th minute Apgar scores, and birthweight between prolapsed and non-prolapsed membrane groups
Apgar: Appearance, pulse, grimace, activity and respiration

Newborns in the prolapsed group had significantly lower birth weights (1752±1210 g vs. 2635±842 g, $p<0.001$). In addition, both 1st-minute ($p<0.001$) and 5th-minute Apgar scores ($p<0.001$) were significantly lower in this group. These findings are also visually supported in **Figure 1**.

The rates of preterm birth (<37 weeks) and PPROM were significantly higher in the prolapsed group ($p=0.001$ and $p=0.023$, respectively). NICU admission ($p=0.003$), NICU length of stay ($p=0.008$), and the need for mechanical ventilation ($p=0.008$) were also significantly more frequent in this group (**Table 2**). No statistically significant differences were observed between the groups in terms of other neonatal morbidities, including RDS, intraventricular hemorrhage (IVH), necrotizing enterocolitis (NEC), hypoglycemia, or need for phototherapy.

To identify predictors of NICU admission, a binary logistic regression analysis was performed including the following variables: presence of prolapsed membranes, low gestational age at delivery, low birth weight, short latency period, 5-minute Apgar score <7, presence of PPROM, and elevated CRP levels (**Figure 2**). Specifically, each 1 mg/L increase in CRP was associated with a 7% higher odds of NICU admission (OR: 1.07; 95% CI: 1.01–1.14; $p=0.024$) (**Table 3**).

The β coefficients for continuous variables have also been presented in **Table 3** to illustrate the magnitude and direction of their association with NICU admission.

According to the forest plot analysis, the presence of prolapsed membranes was identified as an independent risk factor for NICU admission (OR>2). Additionally, parameters such as gestational age at delivery, birth weight, and latency period were included in the model as protective factors (OR<1). Although a 5-minute Apgar score <7 and the presence of PPROM were also associated with NICU admission, their statistical significance was limited due to wide confidence intervals.

DISCUSSION

In this retrospective study, pregnant women who underwent emergency cerclage based on physical examination indication were divided into two groups according to the presence of prolapsed membranes. In cases with prolapsed membranes,

Table 2. Comparison of neonatal outcomes and delivery characteristics between patients with and without prolapsed membranes

Variable	Prolapsed membranes (+) (n=35)	Prolapsed membranes (-) (n=45)	p-value
Cesarean section (%)	17 (48.6%)	26 (57.8%)	0.419 ³
Birthweight (g) [§]	1752±1210	2635±842	<0.001 ¹
1 st min Apgar score*	3 (0–9)	7 (2–9)	<0.001 ²
5 th min Apgar score*	6 (0–10)	9 (5–10)	<0.001 ²
Preterm birth (<37 weeks) (%)	27 (77.1%)	18 (40.0%)	0.001 ³
Preterm premature rupture of membranes (%)	9 (25.7%)	3 (6.7%)	0.023 ⁴
Antenatal corticosteroid usage (%)	22 (62.9%)	26 (57.8%)	0.646 ³
NICU admission (%)	24 (68.6%)	16 (35.6%)	0.003 ³
NICU duration (days) *	4 (0–46)	0 (0–26)	0.008 ²
Neonatal hypoglycemia (%)	1 (2.9%)	0 (0%)	0.403 ⁴
RDS (%)	6 (17.1%)	4 (8.9%)	0.230 ³
Need for CPAP (%)	2 (5.7%)	4 (8.9%)	0.680 ⁴
Need for mechanical ventilation (%)	10 (28.6%)	3 (6.7%)	0.008 ⁴
Need for phototherapy (%)	1 (2.9%)	1 (2.2%)	1.000 ⁴
IVH (%)	4 (11.4%)	1 (2.2%)	0.162 ⁴
Surfactant requirement (%)	1 (2.9%)	2 (4.4%)	1.000 ⁴
NEC (%)	2 (5.7%)	1 (2.2%)	0.570 ⁴
Positive blood culture of newborn (%)	6 (17.1%)	4 (8.9%)	0.297 ³

Data are presented as mean±standard deviation (¶), number (%), or median (*IQR: Interquartile range), where appropriate. $p<0.05$ was considered statistically significant. ¹: Student's t-test, ²: Mann-Whitney U test, ³: Chi-square test, ⁴: Fisher's exact test. Apgar: Appearance, pulse, grimace, activity and respiration, NICU: Neonatal intensive care unit, RDS: Respiratory distress syndrome, IVH: Intraventricular hemorrhage, NEC: Necrotizing enterocolitis, CPAP: Continuous positive airway pressure

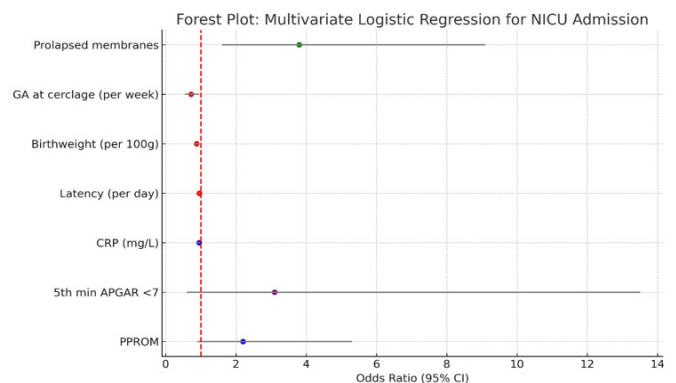


Figure 2. Forest plot of multivariate logistic regression analysis for predictors of NICU admission
NICU: Neonatal intensive care unit, GA: Gestational age, CRP: C-reactive protein, Apgar: Appearance, pulse, grimace, activity and respiration, PPROM: Preterm premature rupture of membranes

Table 3. Binary logistic regression analysis for predictors of NICU admission

Variable	β	OR	95% CI	p-value
Prolapsed membranes	1.335	3.8	1.2–9.0	0.027
GA at cerclage (per week)	-0.386	0.68	0.53–0.87	0.003
Birthweight (per 100g)	-0.151	0.86	0.79–0.94	<0.001
Latency (per day)	-0.030	0.97	0.95–0.99	0.011
CRP (mg/L)	0.068	1.07	1.01–1.14	0.024
5 th min APGAR <7	1.131	3.1	0.9–12.8	0.072
PPROM	0.693	2.0	0.8–5.1	0.118

NICU: Neonatal intensive care unit, OR: Odds ratio, CI: Confidence interval, GA: Gestational age, CRP: C-reactive protein, PPROM: Preterm premature rupture of membranes

the duration of pregnancy was shorter, birth weight was lower, and neonatal morbidity and NICU requirement were higher. Additionally, CRP levels were elevated, and post-cerclage cervical length was measured significantly shorter. These findings suggest that the presence of prolapsed membranes may limit the effectiveness of ECC.

The findings obtained are largely consistent with previous studies. Ocal et al.¹⁰ reported that the presence of prolapsed membranes had a significant adverse effect on perinatal outcomes and that, in particular, the 5th-minute Apgar score was significantly lower in this group. Similarly, in our study, both 1st-minute (median 3 vs. 7) and 5th-minute Apgar scores (median 6 vs. 9) were significantly lower in the prolapsed group ($p<0.001$). These low Apgar scores not only increased the need for postnatal resuscitation but were also identified as independent predictors of NICU admission in our multivariate analysis. As noted by Ocal and colleagues, such early postnatal adaptation disorder may be a determinant of neonatal morbidity in the later period.

In the literature, the latency period has been defined as an important prognostic indicator in evaluating the clinical success of cerclage. Huntley and colleagues reported that in asymptomatic pregnant women with a cervical length of ≤ 10 mm, cerclage extended the latency period to an average of 84 days, whereas in the group without cerclage, this period was only 43 days.¹¹ Yi et al.¹² stated that in patients with cervical dilation, pregnancy lasted an average of 105 days after cerclage, but in the presence of prolapsed membranes, this duration significantly shortened to 42 days. A similar trend was observed in our series: in patients with prolapsed membranes, the latency period was limited to a median of 34 days, while in the non-prolapsed group, this period was 92 days ($p<0.001$). These findings demonstrate that the presence of prolapsed membranes significantly limits the potential of ECC to prolong the duration of pregnancy and that this group carries a higher risk of early preterm birth.

Akkurt et al.¹³ reported that in cases where ECC was performed in the presence of full cervical dilation and prolapsed membranes, the effect on gestational age was limited and neonatal outcomes were poorer. These findings indicate that in the advanced anatomical forms of cervical incompetence, the potential of ECC to significantly prolong pregnancy diminishes. Similarly, in our study, a marked difference was observed in gestational age at delivery between the prolapsed and non-prolapsed groups: while the median gestational age at delivery was 26+5 weeks in the prolapsed group, this value was determined as 33+2 weeks in the non-prolapsed group ($p<0.001$). This difference supports the notion that ECC may provide only limited success in delaying delivery in cases accompanied by advanced cervical dilation such as prolapsed membranes, and that the majority of these cases ultimately result in preterm birth. Pang and colleagues reported the mean gestational age at delivery as 28 weeks in patients who underwent ECC. This figure is also in line with our study findings.¹⁴

Yi and colleagues¹² demonstrated that elevated CRP levels after ECC may serve as an important biomarker for neonatal morbidity. Similarly, in our study, CRP levels were found to

be significantly higher in the prolapsed group. In our binary logistic regression model, each 1 mg/L increase in CRP was associated with a 7% higher odds of NICU admission, suggesting that even modest elevations in CRP may have clinically relevant effects on neonatal outcomes. In the analysis performed using a binary logistic regression model, factors such as the presence of prolapsed membranes (OR: X, 95% CI: Y-Z), CRP level (with increased risk per mg/L), and 5-minute Apgar score <7 were identified as independent predictors of NICU admission. These findings indicate that not only clinical parameters but also laboratory markers play a crucial role in determining the perinatal prognosis following ECC.

In the study by Turgut and colleagues,¹⁵ the decisive role of cervical dilation on the success of ECC was emphasized. Specifically, in cases with a dilation of ≥ 3 cm, despite the application of cerclage, the duration of pregnancy was found to be significantly shorter (195 ± 46 days vs. 227 ± 51 days), and the mean birth weight was markedly lower (1293 ± 1034 g vs. 2159 ± 1153 g). Additionally, in this group, the need for neonatal intensive care rose as high as 74%. These findings indicate that advanced cervical dilation is a significant factor limiting the clinical effectiveness of ECC. Similarly, in our study, the prolapsed membrane group was associated with a shorter pregnancy duration (median latency: 34 days vs. 92 days), an earlier gestational age at delivery (26+5 weeks vs. 33+2 weeks), and a significantly lower birth weight (1752 ± 1210 g vs. 2635 ± 842 g; $p<0.001$). Moreover, the NICU admission rate in this group was 68.6%, which was significantly higher than the 35.6% observed in the non-prolapsed group ($p=0.003$). This parallel supports the notion that prolapsed membranes are frequently accompanied by severe cervical dilation, which in turn may limit the success of ECC.

Deb and colleagues¹⁶ reported that in patients with prolapsed membranes undergoing ECC, the requirement for mechanical ventilation increased significantly, and this was associated with infection, prematurity, and insufficient lung development. Our data also confirm this relationship: the ventilation rate was found to be 28.6% in the prolapsed group and 6.7% in the non-prolapsed group ($p=0.008$).

In line with our findings, Kayıkçı et al.¹⁷ reported that the poorest perinatal outcomes were observed in the PEICC group, with significantly earlier gestational age at delivery, lower birth weight, higher NICU admission rates, and reduced take-home baby rates compared with HICC and UICC groups. These results are consistent with our observation that cases complicated by prolapsed membranes represent the most severe spectrum of cervical insufficiency, with markedly limited efficacy of emergency cerclage. An additional strength of the study by Kayıkçı et al.¹⁷ was the evaluation of suture materials, where no significant differences were observed between Prolene and Mersilene in terms of obstetric or neonatal outcomes. In our series, suture material was not recorded, which should be acknowledged as a methodological limitation. Future studies specifically addressing the potential impact of suture type in patients with prolapsed membranes may provide further insights.

In our study, both gestational age and birth weight were significantly lower in the prolapsed membrane group, and the latency period was also shorter. Additionally, the elevated CRP levels observed in this group are noteworthy. In light of these findings, it is necessary to evaluate the potential mechanisms underlying the limitation of ECC efficacy in the presence of prolapsed membranes.

The presence of prolapsed membranes represents a more advanced anatomical form of cervical incompetence. Fetal membranes exposed to the vaginal environment may come into contact with the microbial flora, leading to subclinical inflammation. This condition can result in elevations in systemic inflammatory markers—particularly CRP—and intrauterine environmental deterioration that may limit the effectiveness of ECC. Additionally, in these cases, the cervical length prior to cerclage was found to be significantly shorter (8.5 ± 5.9 mm vs. 12.3 ± 4.6 mm; $p=0.003$), indicating that cervical support was already severely compromised before the procedure. In the post-cerclage period, cervical length remained significantly shorter in the prolapsed group compared to the non-prolapsed group (16.1 ± 10.2 mm vs. 21.9 ± 6.8 mm; $p=0.006$), suggesting that the mechanical efficacy of the procedure was limited. When all these factors are taken together, the capacity of ECC to prolong pregnancy is markedly reduced in this patient group.

One of the methodological strengths of this study is the exclusion of cases that resulted in delivery within the first 48 hours following cerclage placement. This approach aligns with previous literature that acknowledges such early deliveries are often a continuation of an already advanced labor process and do not allow sufficient time to assess the intrauterine effects of the procedure. This exclusion criterion enabled a more accurate evaluation of the potential of ECC to prolong pregnancy and was planned to minimize possible methodological bias.

Limitations

This study has several limitations. First, due to its retrospective design, the influence of selection bias and uncontrolled confounding variables cannot be ruled out. The fact that data were obtained from archived records carries the risk that some clinical and biochemical variables may have been incompletely or non-standardly recorded. Second, only CRP was used to evaluate inflammation; analyses of more specific and sensitive biomarkers such as amniotic fluid cultures, interleukin-6 (IL-6), or presepsin could not be performed. Therefore, the exact level of intrauterine inflammation could not be fully determined. Third, post-cerclage cervical length was measured only once, and dynamic, longitudinal changes could not be followed. However, changes in cervical morphology after cerclage have been reported to be strongly associated with the timing of delivery. The fourth limitation is that neonatal outcomes were limited to the early postnatal period only. Long-term neurodevelopmental follow-up was not conducted, and therefore the long-term consequences of low Apgar scores, in particular, could not be evaluated. Lastly, the number of patients included in the study was relatively

limited ($n=80$); this may have reduced the statistical power, particularly with regard to secondary outcome variables (such as IVH or NEC), and may have increased the risk of type II error.

CONCLUSION

This study demonstrated the significant impact of prolapsed membrane presence on perinatal outcomes in pregnant women who underwent ECC based on physical examination indication. In cases with prolapsed membranes, gestational age and birth weight were significantly lower, the latency period was shorter, and NICU requirements were higher. Furthermore, elevated CRP levels and lower 5-minute Apgar scores in this group are indicative of intrauterine inflammation and neonatal adaptation disorders.

In multivariate analysis, the presence of prolapsed membranes, elevated CRP levels, and low 5-minute Apgar scores were identified as independent predictors of NICU admission. These findings suggest that the presence of prolapsed membranes not only limits the potential of ECC to prolong pregnancy but also contributes to increased neonatal morbidity.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was approved by the Scientific Researches Ethics Committee of Bursa City Hospital (Date: 09.04.2025, Decision No: 2025-7/12).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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