

Exploring the Limits of Rescue Cerclage by Preoperative Sonography: Imaging Contribution and Therapeutic Considerations

CME
Credits

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Abstract

Cervical insufficiency poses risks for premature birth and neonatal outcomes. Preoperative sonography aids in the diagnosis and therapeutic considerations. Cervical cerclage is effective but carries risks. In our case series, 8 cases failed to complete emergent cerclage, leading to adverse outcomes. Analysis of preoperative images revealed thicker cervixes and cervical strictures may affect the surgical outcomes. Larger studies are needed to determine the reliable cutoff values. Preoperative assessment is crucial to inform treatment decisions.

Keywords: Cervical cerclage, cervical incompetence, emergent cerclage, preterm birth

INTRODUCTION

Cervical insufficiency is a condition that can lead to premature birth and negative outcomes for newborns. Preoperative sonography plays a crucial role in evaluating and diagnosing cervical insufficiency. However, diagnosing this condition remains challenging due to a lack of objective findings and clear diagnostic criteria.^[1-6]

Cervical cerclage is a surgical procedure used to prevent premature birth in women with a weakened or incompetent cervix. It has been shown to be an effective intervention. Nonetheless, it is important to consider the potential risks and limitations associated with the procedure. Studies have identified various risk factors for cerclage failure, including severe cervical dilation, bulging membranes into the vagina, noncephalic fetal presentation, and presence of preterm labor.^[7-9]

In addition to the previous findings, we have observed that cervical thickness, which has not been addressed in previous studies, may also be a risk factor. A thicker cervix could potentially compromise the effectiveness of the cerclage and impact surgical outcomes.

The purpose of this report is to illustrate the preoperative images of patients who experienced failure of emergent

cervical cerclage. We hope to provide a preoperative reference index to identify the candidates who are likely to fail the operation, and perhaps, offer them an alternative treatment option.

CASE REPORT

Due to ethical considerations, the data on the effectiveness of emergency cervical cerclage is derived from the retrospective analyses. From January 2018 to December 2022, a total of 178 patients underwent cervical cerclage at our institution, including 81 who received rescue cerclage and 97 who underwent prophylactic cerclage. Among those who received rescue cerclage, 44 out of 81 (54%) experienced treatment failure.

Figure 1 shows the number of patients, types of the cerclage, and the success rates. The baseline characteristics

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including maternal age, gravidity, parity, maternal height, maternal weight, and gestational age are listed in Table 1, which showed no significant differences between each group.

We reviewed the cerclage operation note of the candidates individually, and the preoperative abdominal sonography was examined. Three main values were measured from the image, including: (1) the dilation of the internal os of the cervix and (2) the ratio of “the dilation of the internal os” to “the total thickness at the level of the internal os (equivalent to the total thickness of the lower segment)”. The example of the measured values is shown in Figure 2. This measured value represents the ratio of the dilation of the internal os to the thickness of the myometrium at the level of the internal os. Patients who have a higher ratio may be at a higher risk of experiencing surgical failure.

A successful operation was defined as not requiring a second surgery and culminating in a full-term delivery. Most of the failures were attributed to adverse outcomes such as chorioamnionitis, uncontrollable preterm labor, or membrane rupture. However, among the 44 patients, 8 cases failed to complete the surgery because of the difficulty and limitations of the surgery.

To determine the limitations and for more accurate evaluation, we thoroughly examined the preoperative sonographic images and operation notes of these patients. All ultrasounds were conducted by skilled technicians and doctors within our institution. The example of the measured values is shown in Figure 2. This measured value represents the ratio of the dilation of the internal os to the thickness of the myometrium at the level of the internal os. Patients who have a higher ratio may be at a higher risk of experiencing surgical failure.

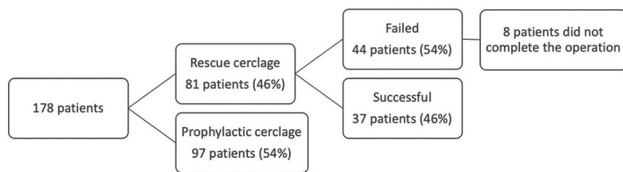


Figure 1: Number of patients who received cervical cerclage, types of the cerclage, and the success rates

The ultrasound images with measured values are shown in Figures 3 and 4, in patients with failed operation and successful operation, respectively.

Table 2 shows the measured data, comparing the patients with successful operation (37 cases) to the 8 cases who failed to complete the operation. The final impressions of these cases, along with preoperative measurements of (1) the dilation of the internal os of the cervix and (2) the ratio of the “total thickness at the level of the internal os” to “the dilation of the internal os”, are detailed in Table 3. Other patient-related information is not listed, because the characteristics showed no significant differences between the successful and failed groups,

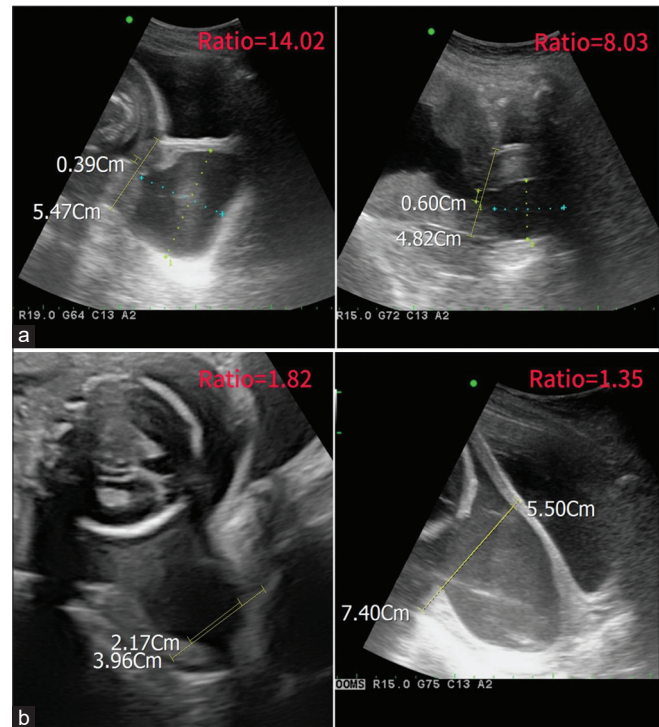


Figure 2: Preoperative imaging of patients with cervical incompetence and bulging amniotic membranes can be used as a risk assessment. This measured value represents the ratio of the dilation of the internal os to the thickness of the myometrium at the level of the internal os. Patients who have a higher ratio may be at a higher risk of experiencing surgical failure. (a) Failed operation. (b) Successful operation

Table 1: Patient characteristics for emergent cerclage outcomes (successful vs. failed)

Patient characteristics	Emergent cerclage (Overall)	Successful emergent cerclage	Failed emergent cerclage	P
Number of patients (n)	81	37	44	-
Maternal age (y)	34.16±4.60	33.73±4.99	34.52±4.26	0.22
Nulliparous(n)	45/81 (56%)	20/37 (54%)	25/44 (57%)	-
Maternal height (cm)	158.06±5.62	157.80±5.53	158.38±5.38	0.32
Maternal weight (kg)	66.32±13.94	63.26±11.38	68.89±15.43	0.035
Maternal BMI (kg/m ²)	26.55±5.42	25.22±4.33	27.67±6.01	0.021
Gestational age (days)	163.33±23.93	165.27±21.95	161.70±25.61	0.25
GDM	11/81 (13.6%)	6/37 (16.2%)	5/44 (11.4%)	-
PIH or preeclampsia	6/81 (7.4%)	3/37 (8.1%)	3/44 (6.8%)	-
Multipregnancy	15/81 (18.5%)	4/37 (10.8%)	11/44 (25%)	-

*Demographic and obstetric characteristics. *Data are given as mean±SD

as presented in Table 1. To establish a reliable cutoff value, larger databases and additional relevant studies are required.

DISCUSSION AND CONCLUSION

This retrospective, observational study aimed to determine the limitations of rescue cerclage through preoperative sonography. Since emergent/rescue cerclage has a higher failure rate compared to prophylactic cerclage, it is crucial to inform patients about the potential limits and complications. In addition to postoperative infections or complications, accurate preoperative assessment is important.

Our hypothesis is that spontaneous closure of the internal os with a thickened myometrial wall would make the operation much more difficult to complete. When the cervix is dilated, the bulging fetal membrane is more likely to be pushed back to their original position during surgery. In our study, we observed that almost all patients who experienced operation failure had a

thicker myometrium at the level of the internal os, accompanied with cervical os narrowing. As a result, these factors may be considered as potential risks for operation failure. Our study indicated that the preoperative imaging of patients with cervical incompetence and bulging amniotic membranes can be used as a risk assessment. The values that can be used as a reference include the ratio of dilation of the internal os to the total myometrial thickness at the level of the internal os. Patients who have thicker myometrial tissue may be at a higher risk of experiencing surgical failure. However, further studies are required to confirm our hypothesis and findings.

Preoperative imaging is a valuable tool for identifying such cases, and it is essential not to rush into the operation. Health-care providers should carefully evaluate each patient's individual circumstances and determine the most appropriate type of cerclage procedure based on their specific needs. It is also crucial to ensure that the cervical cerclage is performed under the most suitable and safe conditions. In cases where transvaginal cerclage is not feasible, transabdominal cerclage, although more challenging and associated with higher morbidity, may be considered as an alternative treatment option.

Amnioreduction techniques may also be beneficial in these cases by reducing the volume of bulging membranes.^[10] While some successful cases have been reported, further studies with larger sample sizes are necessary to validate their efficacy.

Furthermore, assessing cervical thickness is a significant consideration. Cervical elastography has shown promise in determining cervical stiffness and evaluating normal changes in cervical elasticity during pregnancy. This technique has been

Table 2: Measured values comparing patients with successful and failed emergent cerclage

Measurements	Successful emergent cerclage	Failure during the operation	P
Number of patients (n)	37	8	-
Total thickness (cm)	3.73±1.59	5.22±2.10	0.011
Dilation of the internal os (cm)	1.76±1.60	1.15±0.79	0.154
Ratio*	3.58±3.56	8.05±8.05	0.01

*Ratio=thickness of the myometrium at the level of the internal os/dilation of the internal os. **Data are given as mean±SD

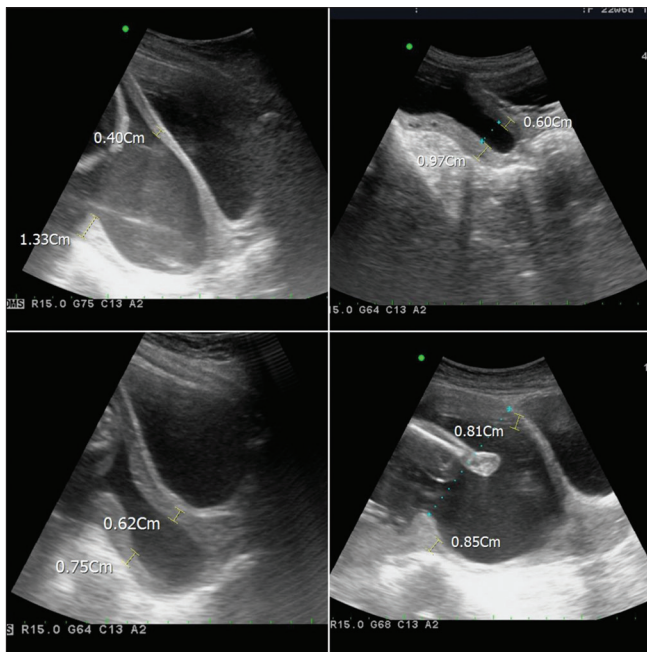


Figure 3: Failure to complete emergent cervical cerclage; preoperative images. The green circle represents cephalad of the patient. The value measured in the picture represents the thickness at the level of the internal os

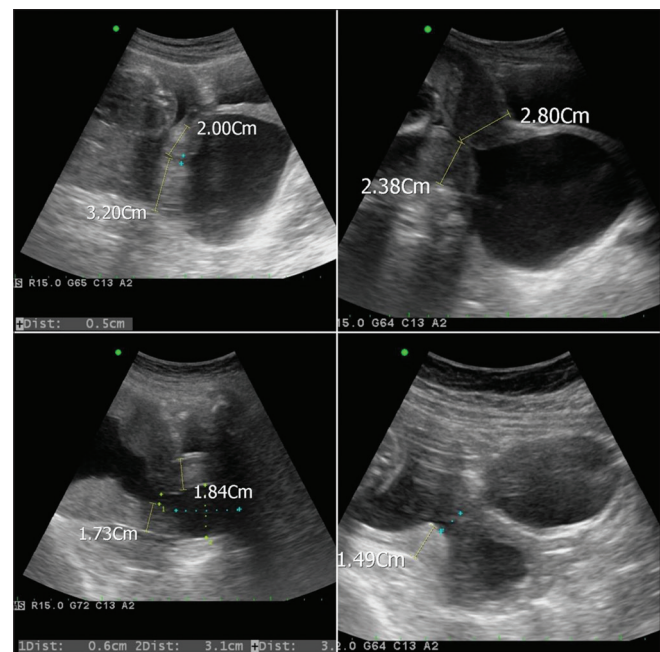


Figure 4: Patients with successful operation; preoperative images. The green circle represents cephalad of the patient. The value measured in the picture represents the thickness at the level of the internal os

Table 3: Final impression of the patients who failed to complete the operation (8 cases)

Patient	Final impression	Total thickness (cm)	Internal os (cm)	Ratio*
1	Gestational age 18 weeks with inevitable abortion, cervical incompetence and bag protruding, status post-McDonald's cerclage on February 12, 2018; with rupture of membrane on February 12, 2018, status postcerclage removal on February 15, 2018, postvaginal delivery on February 15, 2018	6.31	0.25	25.24
2	Gestational age 17 weeks and 5 days with inevitable abortion, status postrescue cerclage on July 21, 2018, and cerclage removal on July 22, 2018; previous cesarean section due to breech, status postpregnancy termination through vaginal birth after cesarean section on July 22, 2018	3.88	1.53	2.54
3	Gestational age 22 + 3 weeks with cervical incompetence, preterm premature rupture of membrane, breech malpresentation status postbreech extraction delivery on April 10, 2019, neonatal death on April 13, 2019	6.91	2.0	3.46
4	Gestational age 21 weeks and 1 day with cervical incompetence postfirst cerclage on July 08, 2019, amniotic bag protruding and antepartum hemorrhage, status postsecondary McDonald's cerclage on August 27, 2019	3.35	1.0	3.35
5	Gestational age 25 weeks with cervical incompetence and bag protruding status postrescue cerclage on July 07, 2020, 07/22, and 07/25; with gestational diabetes mellitus, antepartum hemorrhage, and preterm labor	3.47	0.8	4.34
6	Gestational age 22 weeks 4 days with cervical incompetence and bag protruding, status post-McDonald's cerclage on June 10, 2021, preterm prelabor rupture of membrane on June 12, 2021, status postvaginal delivery on June 19, 2021	4.82	0.6	8.03
7	Gestational age 18 weeks and 5 days with cervical incompetence and bag protruding, but failure of cervical cerclage on January 03, 2023, posttermination and vaginal delivery on January 04, 2023, complicated with placenta abruption	5.47	0.39	14.02
8	Gestational age 23 weeks 3 days with bag protruding, suspect cervical incompetence and placental abruption, status postfailure of McDonald's cerclage and cesarean section, complicated with postpartum hemorrhage on April 06, 2023	7.27	2.64	2.75

*Ratio: Thickness of the myometrium at the level of the internal os/dilation of the internal os

utilized to predict preterm birth, particularly in individuals with a history of cervical insufficiency. Evaluating cervical thickness using elastography could potentially impact the success rate of cervical cerclage. However, the feasibility and availability of cervical elastography in cases of cervical incompetence or protruding membranes need to be determined. The technique requires direct compression of the measured tissue to analyze its elasticity and deformity. Therefore, in cases with concerns of membrane rupture or threatened preterm labor during the procedure, elastography may not be feasible. Nonetheless, it remains a useful method for quantitatively evaluating cervical thickness and estimating the risks associated with cervical cerclage. Further studies are needed to establish a causal association.

Ethics statement

The study was conducted in accordance with the Declaration of Helsinki and was approved by the National Cheng Kung University Hospital (NCKUH) Institutional Review Board (No: A-ER-112-129). Patient Consent was waived by IRB.

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Conflicts of interest

There are no conflicts of interest.

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