

Purpose

Cervical insufficiency is a disorder that can cause abortion or early preterm birth. Cervical cerclage is known as a treatment of this disorder. Rescue cerclage treatment can extend the gestation period and improve neonatal prognosis. For this reason, for woman whose cervix is already dilated, rescue cerclage is selected as an appropriate treatment. but, In the group of rescue cerclage treatment, the rate of very early preterm delivery less than 24 weeks of gestation was 23 %, which was not significantly different from the rate that expectant management had. Rescue cerclage is not largely helpful to a certain group. Therefore, It is important to select candidates to whom rescue cerclage is helpful. Thus, the objective of this study was to determine factors related to surgical success of rescue cerclage and delivery over 28 weeks of gestation and to develop a predictive model for it.

Methods

A retrospective cohort study was conducted with patients who had rescue cerclage during gestation period from 14 to 28 weeks at two tertiary care center 2009 to March 2021. Cerclage treatment included McDonald-type cerclage only. At the time of diagnosis, women with rupture of membrane, major fetal congenital anomaly, clinical suspected chorioamnionitis, regular painful contractions, or multiple pregnancy were excluded. A size of bulged membrane was measured through ultrasound. The width (A) and length (B) of the amniotic sac out of the external os of cervix were measured. The length (C) of the functional cervix that was open with its shape maintained was also measured. After cerclage, cervical length and cerclage height, a distance between the external cervix and a stitch of cerclage, were measured with the use of vaginal ultrasound. If delivery occurred within 48 hours after surgery, it was defined as surgical failure.

Results

A total of 103 patients were included.

Predictors of success and a predictive model of success

The number of patients whose cerclage failed was 15. Among them, two had intraoperative membrane rupture. Compared to the failure group, the success group had significantly higher gestational, less symptoms, and lower positive rates of amnisure and nitrazine tests. In physical examination, the success group had a smaller size of cervical dilation. **With a predictive model of probability of success for cerclage = $6.28941 - 1.00889 \times \text{Ultrasound B (cm)} - 0.57890 \times \text{CRP at admission (mg/dL)} - 0.04885 \times \text{Operation time (min)}$**

Predictors and predictive model of delivery after 28weeks of gestation

The group of delivery over 28 weeks of gestation' was compared with the group of delivery less than 28 weeks of gestation'. We analyzed 96 patients, excluding 7 who did not have delivery information. The former group had higher gestational age, less symptoms, lower WBC ,lower CRP level, and fewer cases of amnisure positive. In physical examination, the group with delivery over 28 weeks of gestation had a smaller size of cervical dilatation.

With a predictive model of probability of delivery over 28 weeks of gestation = $-12.04094 + 0.59767 \times \text{Gestational age (weeks)} + 0.25873 \times \text{Amnisure (0, positive; 1, negative)} + 0.03553 \times \text{Ultrasound C (cm)} - 0.95187 \times \text{Cervical dilatation (cm)}$.

Figure 1. Predictors for predicting success and delivery over 28 weeks of gestation using multivariable analysis. I (A). Relative importance of predictors for predicting success. I (B) Relative importance of predictors for delivery over 28 weeks of gestation. II. Receiver operating characteristic curve of predictive models.

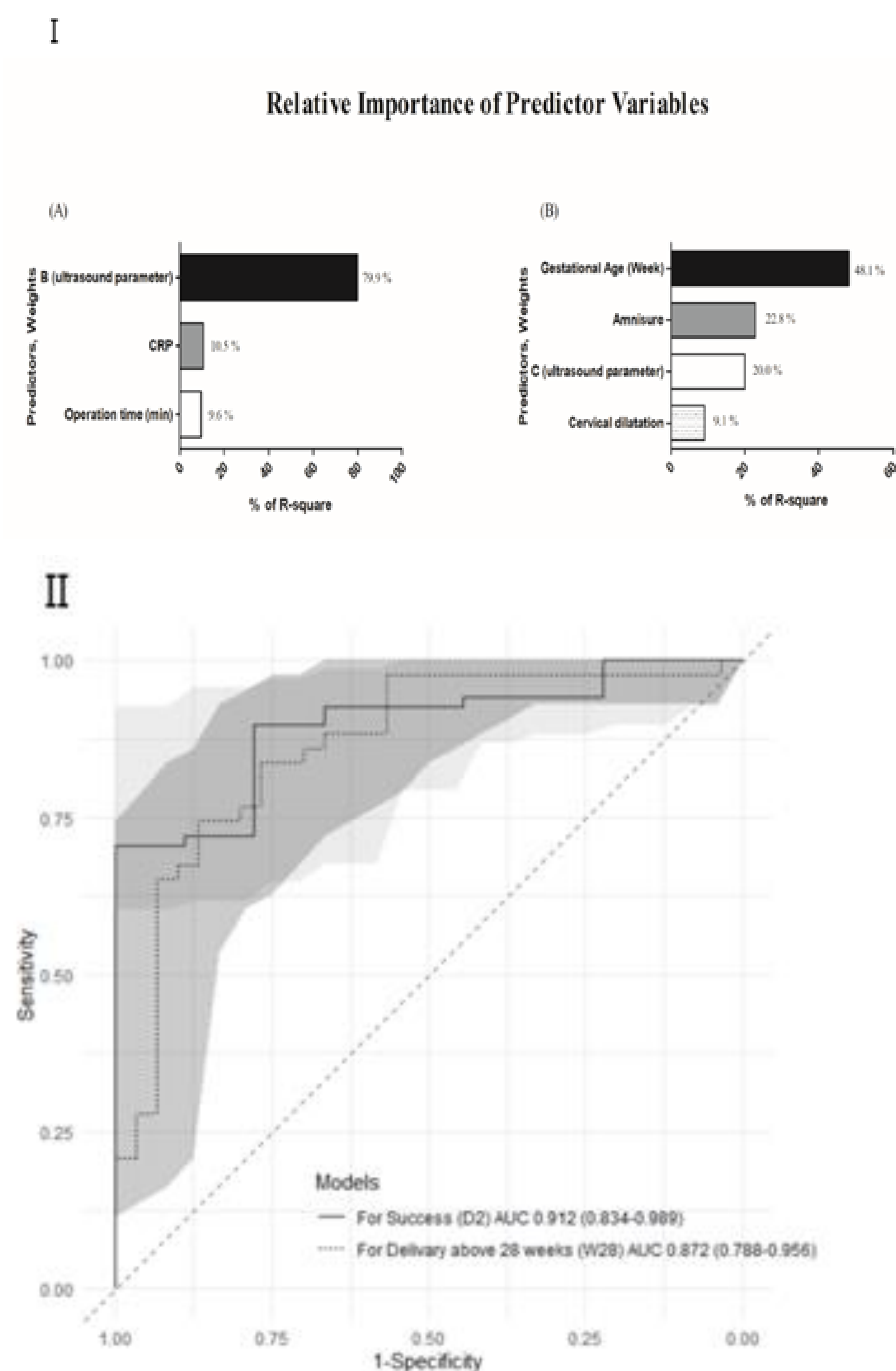


Table 1. Predictive values, sensitivity, specificity, diagnostic accuracy, and differences in AUROCs of the predictive model of success and delivery after 28weeks of gestation

Predictive model	Cut off	Threshold	Sensitivity	Specificity	PPV	NPV	Diagnostic accuracy	95% CI	
Success	0.944	CRP (mg/dl)	70.6	100	100	31.0	0.912	0.834-0.989	
		B (cm)							<1.8
		Operation time (min)							<32
Delivery after 28 wks	0.439	Gestational age (wks)	88.4	73.3	82.6	81.5	0.872	0.788-0.956	
		Cervical dilatation(cm)							<1.18
		C (cm)							>0
		Amisure							Negative

Conclusion

Predictive models proposed in this research are expected to predict a patient's prognosis more objectively and provide counseling for the patient and her family before and after surgery.