

The assessment of cervical ripening using the morphological change in anterior lip thickness with pressure by transvaginal probe compression

Anri Nishida, Takeshi Nagamatsu, Makoto Tsuda, Ryosuke Shibui, Satoshi Okada, Fumio Kataoka, Nobuyuki Susumu
Obstetrics & Gynecology
International University of Health and Welfare Narita Hospital

Abstract

An accurate assessment of cervical ripening is of high value for predicting successful induction of labor. Bishop score is the most common approach for assessing cervical ripening; however, interobserver error, in particular consistency and effacement, is relatively subjective, leading to interobserver variability in the scoring. The focal point of this study pertain to the morphological alterations in the anterior lip of the cervix that were induced by the pressure exerted by a transvaginal ultrasound probe.

The parameters related to cervical ripening were assessed in 34 primiparous women scheduled for induction of labor. In addition to Bishop score and cervical length, the thickness of the anterior lip was evaluated before the induction of labor. This evaluation was performed by means of transvaginal ultrasound, with the thickness of the anterior lip being measured before and after compression.

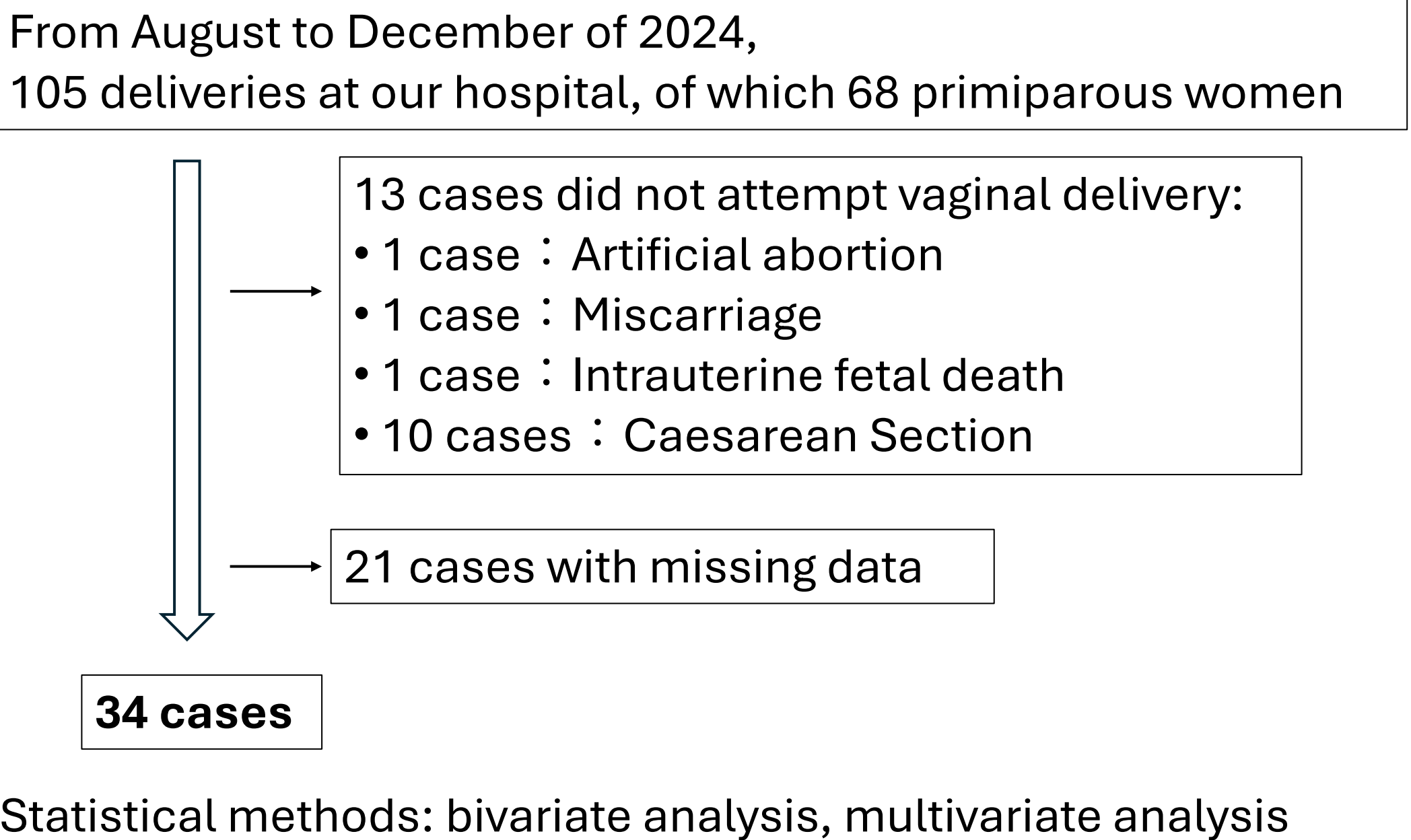
The change in the anterior lip thickness before and after compression exhibited a positive correlation with Bishop score ($R = 0.60$, $p < 0.001$). No significant correlation was found between cervical length and Bishop score.

In conclusion, the observed morphological change in anterior lip thickness with pressure by transvaginal probe compression could be a new indicator for assessing cervical ripening.

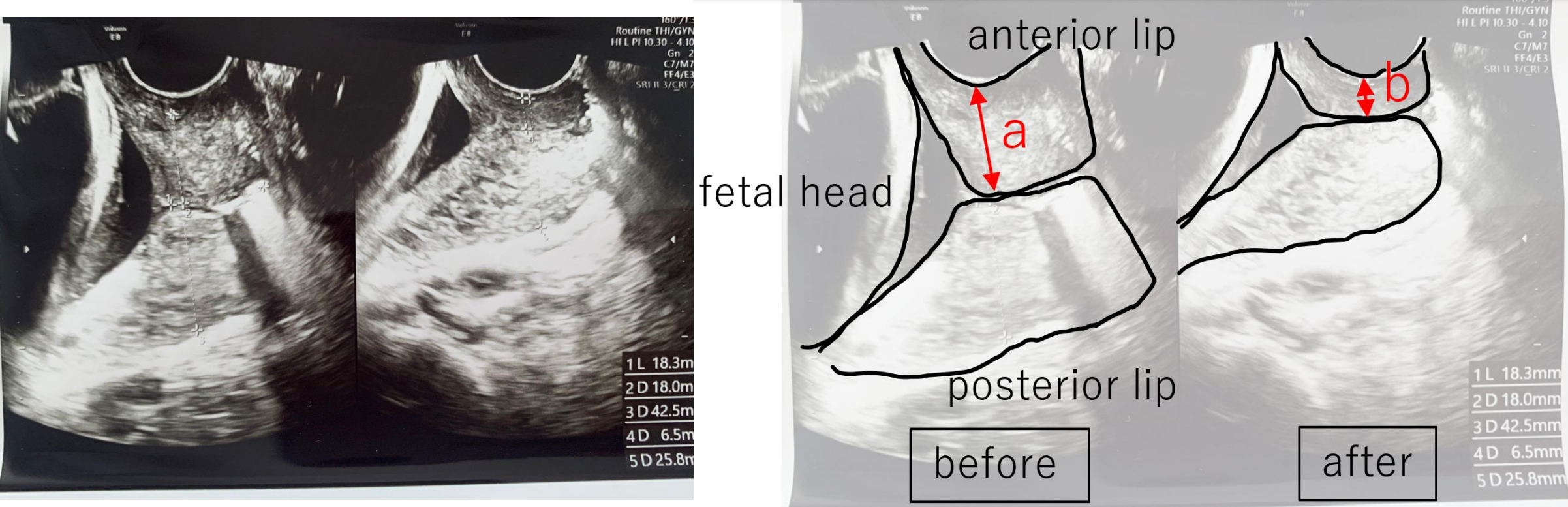
Introduction

- An accurate assessment of cervical ripening is clinically important for predicting the success of labor induction, and Bishop score assessed by vaginal examination is the most common approach.
- However, interobserver variability is recognized as a problem in Bishop scoring system.
- Particularly, there is a difficulty in objective evaluation of effacement and consistency.
- As an alternative approach, several groups have previously reported on the use of cervical length measurement for the prediction of delivery outcomes.
- In this study we adopted a novel approach by focusing on the morphological changes of the anterior lip of the cervix caused by pressure from a transvaginal ultrasound probe, then we examined a method for assessing the degree of cervical ripening.

Outline of study



Method

- * IOL(induction of labor) is planned in most cases according to the patients' wishes.
- This is an observational study.
 - From August to December of 2024, a total of 105 deliveries were recorded at our hospital, of which 68 were attributed to primiparous women. In the course of the analysis, 10 cases of planned cesarean section, 1 case of induced abortion, 1 case of spontaneous abortion, and 1 case of intrauterine fetal death were excluded. The remaining 55 term pregnancies scheduled for induction of labor* underwent both vaginal examination and transvaginal ultrasonography.
 - After the exclusion of 21 cases due to incomplete records, analyses were conducted on a total of 34 primiparous women with complete data.
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- Following the insertion of the transvaginal ultrasound probe, the thickness of the anterior lip of the cervix (a) was measured without compression from the tip of the transvaginal probe (*). In the next, pressure was applied to the anterior lip with a force that did not cause any noticeable deformation of the posterior lip. At that point, the thickness of the anterior lip (b). The “formula 1”delineated as “a/b” is assessed in **Formula 1**.
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- Considering that the a/b value changes depending on the degree of pressure applied to the anterior lip, the a/b value was corrected using measurements of the thickness of the posterior lip (**Formula 2**) or the thickness of the cervical canal (**Formula 3**).
 - We analyzed the relationship between the Bishop scores checked at the same time as the ultrasonography of the cervical measurement and the parameters obtained from the three formulas.

Formula 1 = a/b

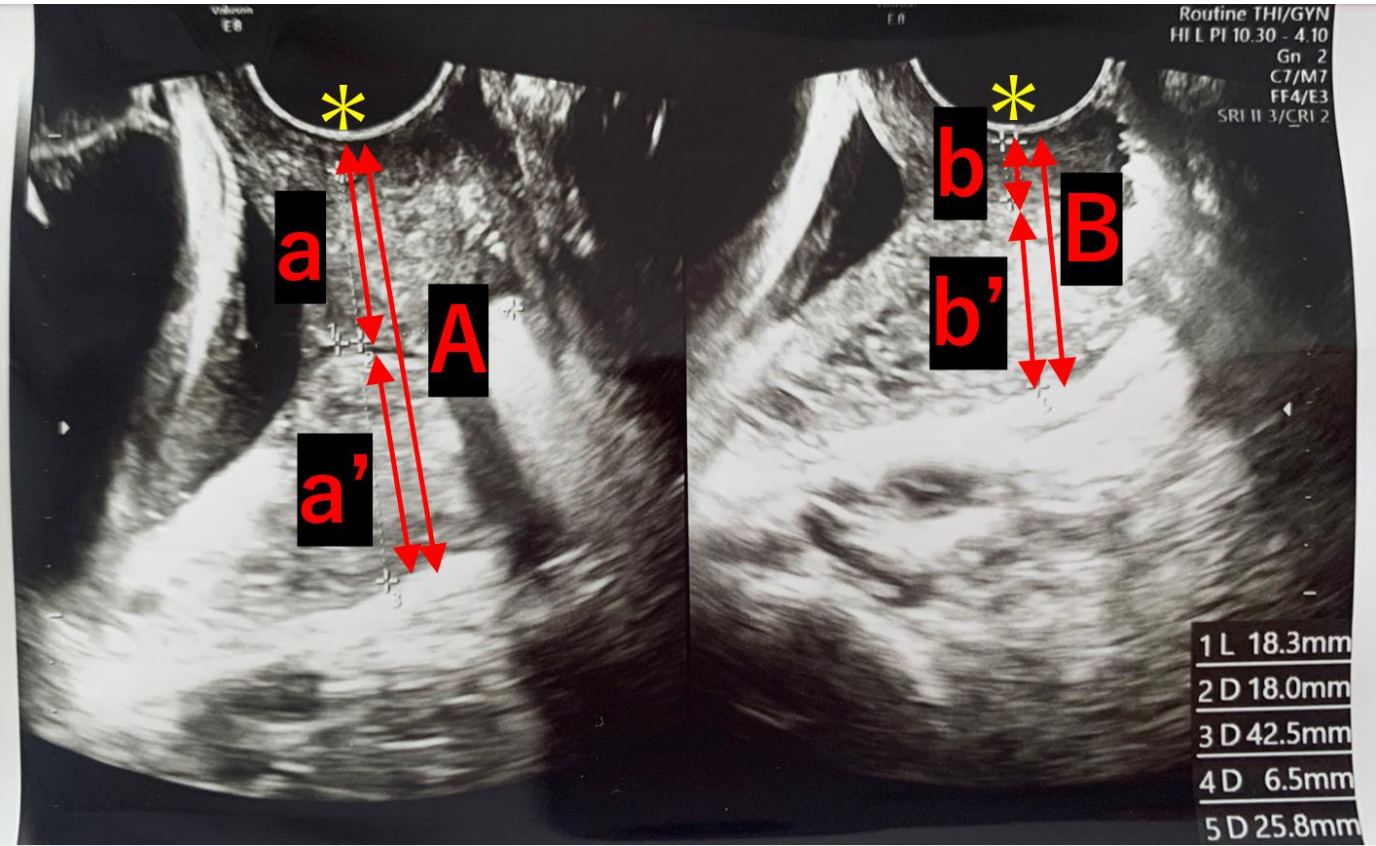
The ratio of the change in the anterior lip between before and after pushing (a/b).

Formula 2 = (a/b) / (a' / b')

The ratio of the change in the anterior lip adjusted by the posterior lip between before (a') and after (b').

Formula 3 = (a/b) / (A/B)

The ratio of the change in the anterior lip adjusted for the overall thickness between before (A) and after (B).

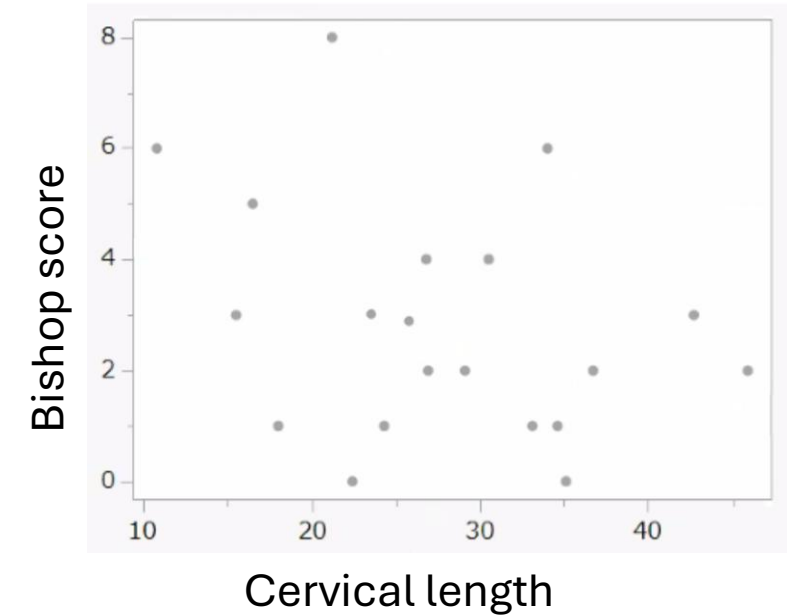
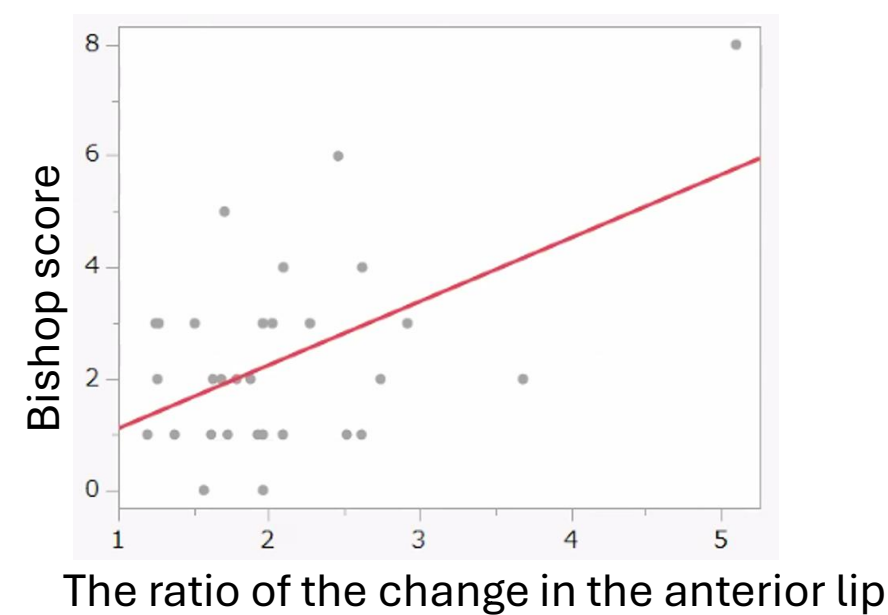


Result

- The correlation between the values obtained using the three formulas and the Bishop score is shown in the table below.

Formula No.	Explanation	Calculation formula	R	p
1	anterior lip changing ratio	a/b	0.52	0.0036
2	anterior lip changing ratio adjusted by the posterior lip ratio	(a/b) / (a' / b')	0.58	0.0009
3	anterior lip changing ratio adjusted for the overall thickness	(a/b) / (A/B)	0.60	0.0005

- Changes in the anterior lip co the cervix with pressure were significantly correlated with Bishop score. The strongest correlation was observed when corrected for the overall thickness of the cervical canal.
- There was no significant correlation between cervical length and Bishop score (right figure shown below).



Discussion

- Alternative approaches to assess cervical ripening include the use of cervical length, the cervical sliding sign and ultrasound elastography have been reported. However, Bishop scoring is still the gold standard in dairy practice.
- It is noteworthy that the method of evaluating cervical ripening demonstrated in this study showed a significant correlation with BS.
- The method implemented in this study is simple and easy, giving an advantage for introduction in clinical use.
- In order to clarify clinical usefulness, it is necessary to conduct the research with larger sample sizes and analysis on the relationship with delivery outcomes.

Conclusion

Changes in the thickness of the anterior lip caused by compression from the transvaginal ultrasound probe may serve as a novel indicator for assessing cervical ripening.

References

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