

Screening for spontaneous preterm birth by cervical length and shear-wave elastography in the first-trimester of pregnancy

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Objective

To compare the predictive value of cervical length measured by two different methods in the first-trimester of pregnancy for spontaneous preterm delivery, and explore the potential value of first-trimester cervical shear-wave elastography for the prediction of spontaneous preterm delivery.

Methods

A prospective study in unselected singleton pregnancies at 11⁺⁰-13⁺⁶ weeks' gestation. Cervical length was measured by two methods in the base-cohort population: (i) a linear distance between the two ends of the glandular area around the endocervical canal (single-line method: cervical length-s) and (ii) a sum of a linear distance from the internal os to the greatest cervical curvature and a linear distance from this point to the external os (two-line method: cervical length-t). In a substudy, cervical shear-wave elastography scores of nine regions of interest (inner, middle and external parts of anterior lip, endocervical canal and posterior lip) in mid-sagittal plane were also obtained by transvaginal ultrasonography. The screening performance of the first-trimester cervical length measured by the two different methods for the prediction of spontaneous preterm delivery was assessed by receiver-operating characteristics curve analysis. The areas under the curves were compared by De Long test. Predictive performance of a soft cervix (mean elastography scores multiple of median [MoM] <5th, 10th, 15th, 20th and 25th percentile) for spontaneous preterm delivery was also determined.

Results

Among a total of 2316 included pregnancies, spontaneous delivery at <37 and <34 weeks occurred in 111 cases (4.8%) and 20 cases (0.9%), respectively. In the total study population, compared to the term delivery group, the median cervical length-t was shorter in women with spontaneous delivery at <34 weeks (36.9 mm vs 35.1 mm, P=0.015), but not for cervical length-s. Receiver-operating characteristics curves demonstrated that cervical length-t achieved better performance in predicting spontaneous delivery at <34 weeks (area under the curve: 0.658 vs 0.573, P<0.01) than cervical length-s. The best combined model to predict spontaneous delivery at <34 weeks was provided by cervical length-t and previous history of preterm birth (area under the curve: 0.692). In the substudy, a soft cervix with mean elastography scores MoM <10th percentile had a relative risk 7.8 (95% confidence interval 2.1-28.6) for spontaneous delivery at <34 weeks; the detection rate was 44.4% at false-positive rate of 9.0%.

Conclusion

The two-line approach provides a better estimate of the actual first-trimester cervical length and achieves better performance as a screening tool for spontaneous preterm delivery at < 34 weeks' gestation compared with the conventional measurement. A soft cervix determined by shear-wave elastography in the first-trimester is associated with an increased risk of subsequent spontaneous preterm delivery.