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Sonopartogram: factors that affect labor progress in women undergoing induction of labor

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Objective

The traditional approach to assess progress of labor is by digital vaginal examination (VE), however, it is subjective and imprecise. Recent studies have investigated the role of transperineal ultrasonographic (TPU) assessment of cervical dilatation and fetal head descent by measuring angle of progression (AOP) and head-perineum distance (HPD). The objective of this study was to evaluate factors that affect labor progress defined by TPU parameters in women achieving successful vaginal delivery (VD).

Methods

This was a prospective longitudinal study performed in 249 women with singleton pregnancy undergoing induction of labor (IOL) at term in a single maternity unit in Hong Kong SAR. Almost simultaneous assessment of cervical dilatation and fetal head station by VE and TPU assessment of fetal head descent (AOP and HPD) and cervical dilatation were made serially following the commencement of IOL until full cervical dilatation. The researchers were blinded to the findings of the clinical team's VE. In women achieving VD, comparisons of slope regression lines of TPU parameter hourly rate of change (Δ1) against cervical dilatation and fetal head station between (i) different methods of IOL, (ii) nulliparity and multiparity, (iii) body mass index (BMI) <30 Kg/m2 and >30 Kg/m2 (iv) age <35 and >35 years and (v) with and without epidural anesthesia were performed by Covariance analysis.

Results

209 (83. 9%) women achieved VD and 40 (16. 1%) women required Cesarean section. Following the commencement of IOL, the total number of paired VE and TPU assessments in women with VD was 537, with a median of three per woman. The median assessment-to-assessment interval was 4. 6 hours (interquartile range 4. 3-5. 2). Sonographic assessment of cervical dilatation (SCD) was not possible in 52 (7. 5%) occasions because of advanced stage of labor (cervical dilatation >8 cm). Inspection of a scatterplot of SCD vs cervical dilatation by VE identified that SCD did not correlate with cervical dilatation when it was beyond 6 cm. Multiparous women with VD had steeper slope of AOP and HPD against fetal head station than nulliparous women with VD (AOP Δ1: 1. 93 vs. 1. 10; p=0. 004; HPD Δ1: -0. 12 vs. 0. 06; p=0. 005). The same observations were found for women who underwent IOL by mechanical methods (artificial rupture of membranes or balloon), in comparison to those with Propess® (AOP Δ1: 1. 79 vs. 0. 97; p=0. 002; HPD Δ1: -0. 25 vs. -0. 16; p=0. 006). In addition, the use of epidural anesthesia was associated with slower changes in AOP Δ1 and HPD Δ1 against fetal head station than those without (p=0. 03 and p=0. 01). Obesity was associated with a slower fetal head descent, determined by AOP Δ1 (15. 05 vs. 11. 43; p=0. 03). Advanced maternal age did not influence the rate of labor progress. Differences in Δ1 of TPU parameters against cervical dilatation between different groups were not observed.

Conclusion

Maternal BMI, parity, methods of IOL and the use of epidural anesthesia affect labor progress as demonstrated by an ultrasound-based partogram.