



Transperineal ultrasound technique for evaluating angle of progression and predicting vagina delivery in Hung Vuong hospital, Vietnam

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General Note



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ABSTRACT

Objective: To evaluate the sensitivity and specificity of a transperineal ultrasound technique for assessment of the angle of progression during labor. **Methods:** We carried out a diagnostic test study. Transperineal ultrasound in 375 pregnant women with an

uncomplicated pregnancy, singleton, crown, a full month in the second stage of labor in Hung Vuong Hospital. *Results:* The angle of progression was more significant than or equal to 120 degrees on the transperineal ultrasound with sensitivity (96.5%), specificity (17.5%), PPV of 0.86, NPV of 0.47. The vaginal birth rate of ≥ 120 degrees is 96.2%. Correlation between transperineal ultrasonography on the pelvic floor of the uterus, mononuclear maturation, maturation, and crown with birth outcomes: progressive angle ≥ 120 degrees, has 1.66 times higher in vaginal delivery than the angle of progression was <120 degree, 95% CI [1.09 - 2.49]. The optimal progressive angle was 152 degrees with sensitivity, specificity for vaginal delivery was 50%, and 87.7% (Youden score). *Conclusion:* Transperineal ultrasound can help clinicians to evaluate the fetus head position during labor. More research is needed on this issue in the future.

Keywords: angle of progression, transperineal ultrasound, the second stage of labor, diagnostic test study.

1. INTRODUCTION

Now, the prevalence of cesarean delivery tends to increase worldwide. For example, in the United States in 2011, 1 in every three women would have a caesarean section, among those who had a first caesarean section, the most common indication for a caesarean section was the abrupt progress (34%) (Tutschek et al., 2011). Hung Vuong Hospital is one of the two major obstetric and gynecological hospitals in southern Vietnam. The hospital has 1,000 beds with over 200 obstetricians specializing in Obstetrics and Gynecology; the total number of babies born at Hung Vuong hospital is over 40,000 per year. At Hung Vuong hospital, the rate of cesarean delivery tends to increase in 2015 and 2019 at 42.2% compared to 50%. In which, the first caesarean section accounted for 62.8% and indicated caesarean section because the fetus stopped progressing accounted for 1/3. Currently, in clinical practice, the doctor diagnoses the discontinuation based on the presentation of the fetus, not to the mother's pelvis. The assessment of the incidence of reincarnation during labor is always based on the correlation between the lowest part of the reincarnation and the two hip spines (Dietz and Lanzarone, 2005).

However, in practice, there is still an empirical difference in the evaluation method between doctors, which reflects the difficulty and unreliability of clinical evaluation. Especially when reincarnated with a tumor and/or a curvature (with an overlapping bone). Therefore, a more objective method of evaluating abortion is needed to give clinicians more information to decide in cases of abortion. When labor stops or insufficiency placenta, the obstetrician needs to choose between operative delivery or caesarean section. If the operative delivery is successful, it is safer than emergency surgery. Because reincarnation moves into the mother's pelvis, caesarean section during the second stage of labor is associated with an increased risk for the mother, such as bleeding, bladder damage, the additional incision in the uterus leading to mass hematoma in the broad ligament. In addition, caesarean section postpartum caustic failure or forceps caesarean section failure are also associated with the risk of fetal injury (Tutschek et al., 2011).

Recent reports have showed the value of ultrasound in the assessment of parameters indicative of the progress of labor, such as to evaluate of the angle of progression by transperineal ultrasound gives an objective, accurate and reproducible method for defining the fetal head progression during labor. Estimation of AoP could also be useful for the management of term pregnancies. In a recent study concerning the second stage of labor, it was shown that the greater the angle of progression, the greater the probability of successful assisted or spontaneous delivery (Kalache et al., 2009). Because ultrasound during labor can be used to diagnose abnormalities in labor and to predict the likelihood of successful vaginal delivery for improving maternal and fetal outcomes, we conducted a study with the aims:

Determination of sensitivity, specificity, positive predictive value and negative predictive value of progression angle greater than or equal to 120 degrees on perineal ultrasound in pregnant, mature, occipitoanterior position, and at the end of the second stage of labor.

2. MATERIAL AND METHODS

Study population

Pregnant women with uncomplicated pregnancy, single pregnancy, pyramid, full term and cervical cancer at Hung Vuong Hospital in Ho Chi Minh City. Ho Chi Minh City from September 2016 to June 2019, met the admission criteria and agreed to participate in the study.

Ultrasound images were acquired with all women in the same supine position and with an empty bladder.

Imaging protocol

A two-dimensional Aloca Pro Sound 2 portable ultrasound system with a 5-MHz convex transducer was used. Informed consent was obtained from all patients, and the study was approved by the local ethics committee. The procedure was as follows (Figure 1). Transperineal ultrasound images were obtained by placing a covered transabdominal transducer on the perineum in a mid-sagittal position between the labia below the pubic symphysis. First, lateral movements of the probe were made until an image was obtained that did not contain shadow from the pubic rami and showed a mid-sagittal view with clear visualization of the pubic symphysis and the fetal skull. The probe was then displaced laterally until the pubic ramus was clearly visualized within the symphyseal capsular tissue. Care was carried out to project the acoustic shadow generated by the pubic ramus above the presenting part of the fetal skull by tilting the transducer. Fetal head descent was quantified by measuring the angle between a line placed through the midline of the pubic symphysis along the pubic ramus and a line running from the inferior apex of the symphysis tangentially to the most anterior part of the fetal skull.

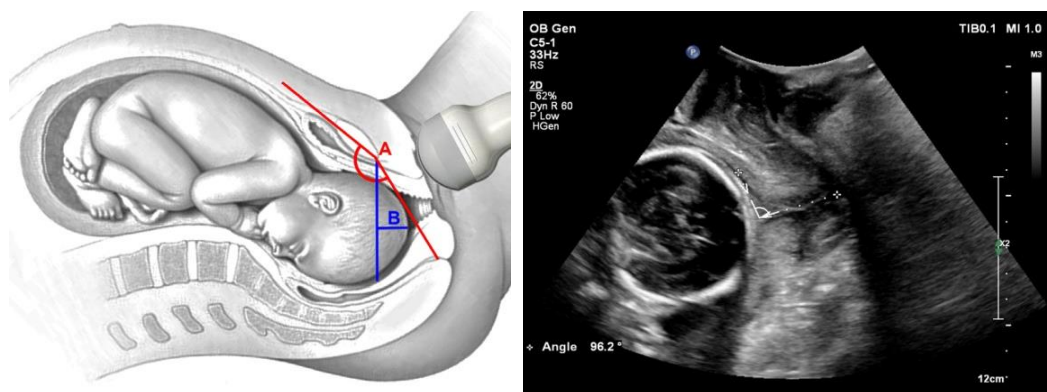


Figure 1 Diagram showing the method of transperineal ultrasound : (A) angle of progression and (B) head progression distance

Statistical analysis

Data are encrypted and entered using EpiInfo 3.0 program. Data analysis using STATA 12.0 software.

3. RESULTS

A total 375 pregnant women fully filled inclusion criteria were analyzed. Table 1 shows the general characteristics of the patients. The prevalence of vagina delivery was 84.8% with 95% CI [80.8 – 88.3]. Table 2 presents the laboratory findings. The angle of progression in predicting the occurrence of vaginal birth is showed in Table 3.

Table 1 Demographic characteristics of the study population (n=375)

Variables	Number/ Mean (or median) $\pm$ SD	Percentage (%)
Maternal age, y		
< 20	11	2.9
20 – 35	339	90.4
>35	25	6.7
Rural	150	40.0
Urban	225	60.0
Primigravida	270	72.0
Gravida	105	28.0
Body Mass index		
Nomal	175	46.7
Overweight	176	46.9
Obesity	24	6.4
Height of maternal, cm	156.4 $\pm$ 5.0	
Weight of maternal, kg	62.6 $\pm$ 8.2	

Table 2 Labor characteristics

Variable	Number/ Mean (or median) $\pm$ SD	Percentage (%)
Gestational age, wk	38.5 $\pm$ 0.9	
Weight of baby, gram	3066 $\pm$ 365	
Angle of progression, degree	149.1 $\pm$ 19.4	
Head progression distance, mm	50.3 $\pm$ 12.6	
Epidural anesthetics, yes	208	55.5
Epidural anathesics, no	167	45.5
Spontaneous vagina delivery	257	68.5
Operative delivery	61	16.3
Cesarean section	57	15.2

Table 3 Angle of progression in predicting the occurrence of vaginal birth

Value	Vagina delivery	
	Yes	No
Angle of progression $\geq 120^\circ$	306	46
Angle of progression $< 120^\circ$	12	11

Vagina delivery = Spontaneous delivery + Operative delivery. Sensitivity 96.5%; Specificity 17.5%; Positive predictive values 86.9%; Negative predictive values 47.8%

4. DISCUSSION

Digital estimation of the head station as a method for determining the level of the fetal head during labor is imprecise and poorly reproducible. In a previous study, substantial differences between the opinions of consultants and specialists on fetal head descent, as assessed by digital vaginal examination were observed in 81% of cases, suggesting that digital test requires the long-standing experience (Olah, 2005). A study using a birth simulator found that digital vaginal examination of fetal head descent was unreliable, with errors occurring in 50–80% of tests depending on the right level of the head (Dupuis et al., 2005). A recent prospective study of fetal head station in 508 women in term labor found inferior interobserver agreement (kappa statistic for agreement 0.23; 95% CI, 0.17–0.29) in estimating fetal headstation (Buchmann and Libhaber, 2008). In Vietnam, there are about 1 million newborns every year, in obstetric hospitals, including our Hung Vuong hospital, the assessment and prognosis of fetal pregnancy mainly digital estimation of the head station. Thus, obstetricians continue to search for amore reproducible method for assessing fetal head station. Recent editorials have emphasized the need for a reliable and straight forward ultrasound-based method for quantifying fetal head engagement (Ville, 2006; Yeo and Romero, 2009). Transperineal ultrasound measurement is emerging as a widely available, easy to perform, and risk-free method for assessing progressive descent of the head through the pelvis (Barbera et al., 2009; Barbera et al., 2009), and transtibial ultrasound assessment has also been suggested (Ghi et al., 2009).

According to Barbera et al., the AoP is defined as the angle between the longitudinal axis of the pubic symphysis and the line from the anterior edge of the pubic symphysis tangentially to the leading edge of the fetal skull. In the present study, to increase reliability and reproducibility, AoP measurements were obtained using the centroid of the pubic symphysis rather than its distal point as the symphysis landmark, since this is a more stable marker that is more easily detected. Thus, the resulting AoP was the angle between the longitudinal axis of the pubic symphysis and the line running from its centroid tangentially to the leading edge of the fetal skull. Technically, the centroid is defined as the point corresponding to the 'center of mass' of the pubic symphysis and can be identified analytically through a calculation that takes into account the locations of single symphysis pixels and their intensity values. From a practical point of view, the centroid can be identified by an operator easily, and with optimal accuracy, as the center of symmetry of the brightest symphysis area on the image (Barbera et al., 2009).

In our study, perineal ultrasound evaluated AoP at which cervical time progressed to help predict vaginal delivery. With the AoP of 120° , we recorded the sensitivity and specificity of 96.5% and 17.5%, respectively. In this study, we recorded the best cut value of 152° with sensitivity and specificity of 50% and 87.2%, respectively. The use of the AoP for evaluating the possibility of vaginal delivery has been studied and agreed upon by many authors. However, the sensitivity and specificity published with results differed between studies. However, the general point noted from the studies, the greater the progression angle, the greater the likelihood of natural vaginal delivery or supportive devices (Barbera et al., 2009; Kalache et al., 2009). Still, this probability increases, to 85.5% if the AoP is 120° , this result is also recorded in Kalache and Barbera , they found that among all vaginal delivery births there was an

increase progression angle and natural birth in all cases with AoP above 120° (Barbera et al., 2009; Kalache et al., 2009). Marsoosi and colleagues in their study noted that the greater the angle of progression in labor, the shorter the delivery time (Marsoosi et al., 2015). Barbera pointed out that the greater the progress of patients, the quicker the time from cervical dilatation to delivery. After analysis, the author noted that when the angle of improvement is less than 135°, the median time is 45.5 minutes, this time is short when the progression angle is more significant (Barbera et al., 2009).

In our study, the vaginal delivery rate was 84.8%, of which natural delivery accounted for 80.7%, and the remainder was the operative delivery of the device (Forceps or Ventous). The rate of vaginal delivery in our study was quite similar to that of Kalache (Kalache et al., 2009). The rate of cesarean section in our study is 15%. This rate of caesarean section is similar to studies such as Yuce (Yuce et al., 2015) and Kalache (Kalache et al., 2009), higher than the results of Barbera's study (Barbera et al., 2009). Similar to many studies in the world, perineal ultrasound evaluates the labor process as an easy-to-learn and easy-to-follow method for obstetricians practicing obstetric practice (Adam et al., 2014). Therefore, the training and implementation of this new ultrasound method can be easily implemented and applied in obstetric hospitals.

5. CONCLUSION

Transperineal ultrasound is promising and suggests a potential role for the angle of progression as a reliable and straight forward marker of progressive fetal head descent. Studies like ours that include a greater number of observers are required to validate the use of the angle of progression for decision making in cases with the prolonged second stage of labor and in future research trials.

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Conflicts of Interest: The authors declare no conflict of interest.

Informed consent

Informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethical approval for study protocol

The study was approved by the Medical Ethics Committee of Hung Vuong Hospital (ethical approval code: 0169-HVH).

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