Rama Med J 2012; 35: 14-18

Original Articles/นิพนธ์ต้นฉบับ

Intrapartum Amniotic Fluid Index as Predictor of Perinatal Outcome in High Risk Pregnancy.

Chittacharoen A, MD., Chinawuth C, MD., O-Prasertsawat P, MD.

Department of Obstetrics & Gynaecology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok 10400 Thailand

Abstract

Objective: To determine the diagnostic value of amniotic fluid index in the early intrapartum period for predicting of perinatal outcome in high risk preganancy.

Methods: Four hundred and fifty high risk pregnant women of at least 34 weeks gestation were recruited at Department of Obstetrics and Gynaecology, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand. The measurement of four-quadrant amniotic fluid index was performed by ultrasonography in the early intrapartum period. The amniotic fluid index ≤5 cm was the cutoff point for the predicting of poor perinatal outcome. The result of amniotic fluid index was compared to the perinatal outcome outcome using sensitivity, specificity, negative predictive value, positive predictive value and accuracy.

Results: Among 450 high risk pregnancies, 92 cases (20.44%) were amniotic fluid index ≤5 cm, and 358 cases (79.56%) were amniotic fluid index >5 cm. The incidence of poor perinatal outcome was 16.67%. An intrapartum amniotic fluid index of ≤5 cm, in comparison with >5 cm, is associated with an in-creased risk of poor perinatal outcome (P <0.05). The sensitivity, specificity, positive and negative predictive values and accuracy of four-quadrant amniotic fluid index ≤5 cm for predicting perinatal outcome were 72%, 89.6%, 58.69%, 94.13%, and 86.88%, respectively.

Conclusion: An intrapartum amniotic fluid index of ≤5 cm is associated with a significantly increased risk of poor perinatal outcome. The amniotic fluid index measurement is an effective diagnostic test to identify fetus at risk in the intrapartum period of the high risk pregnancy.

Keywords: Intrapartum, amniotic fluid index, perinatal outcome, high risk pregnancy.

Corresponding Author: Chittacharoen A, MD.
Department of Obstetrics & Gynaecology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok 10400 Thailand
Tel: 66-2-2011412 Fax: 66-2-2011416
E-mail: raaco@mahidol.ac.th

Introduction

Fetal admission test is a means to identify patients who may require cesarean delivery for a nonreassuring fetal heart rate tracing and be delivered of a depressed newborn infant.[1] The theoretic benefit of such a test is that it can identify patients who antepartum risk factors missed and triage patients in a busy labor and delivery suite with limited resources. Cardiotocography for 20 minutes, response to vibroacoustic stimulation, Doppler scans of the umbilical artery, and sonographic assessment of amniotic fluid are 4 diagnostic modalities that have been used to the assessment of fetal well being on admission.[2-6] Of these 4 tests, the evaluation of the amniotic fluid is the most frequently studied. The problem with using the amniotic fluid index (AFI) to predict peripartum complications is conflicting reports about the ability of oligohydramnios (AFI, ≤5.0 cm) to identify poor out comes accurately and that the use of the test may increase interventions without improving neonatal outcome.[7-9] For example, the randomized clinical trial (RCT) that either obtained AFI in early labor or did not assess fluid noted that the rate of cesarean delivery was significantly higher among those who underwent sonographic evaluation even though the neonatal outcomes, which included Apgar score at 1 minute, were similar between the two groups.[10] The objective of this study is to determine the diagnostic value of amniotic fluid index in the early intrapartum period for predicting of perinatal outcome in high risk pregnancy.

Material and Methods

The prospective study was conducted at Department of Obstetrics and Gynaecology, Ramathibodi Hospital, Faculty of Medicine, Mahidol University, Bangkok, Thailand. The high risk pregnant women of at least 34 weeks gestation who were admitted to labor and delivery were recruited in the study. The measurement of amniotic fluid was performed by four-quadrant amniotic fluid index technique which defined by first dividing the uterus into four quadrants using the linea nigra for the right and left divisions and the umbilicus for the upper and lower quadrants. The maximum vertical amniotic fluid pocket diameter in each quadrant not containing cord or fetal extremities is measured in centimeters; the sum of these measurements is the AFI. The ultrasonography was performed in the early intrapartum period with the use of an Hitachi EUB 415 device. Women who were assigned to the AFI had their amniotic fluid volume estimated by the four-quadrant technique measurement. The amniotic fluid index ≤5 cm was the cut-off point for the predicting of poor perinatal outcome. The poor perinatal outcome was defined as fetal distress, thick meconium stained amniotic fluid, Apgar score <7 at 5 minutes, cesarean delivery for fetal distress, admission at NICU, perinatal death. The result of amniotic fluid index was compared to the perinatal outcome using sensitivity, specificity, positive predictive value, negative predictive value, and accuracy.

Results

Four hundred and fifty high risk pregnant women were recruited in the study. Among 450 cases, 92 cases (20.44%) were amniotic fluid index ≤5 cm, and 358 cases (79.56%) were amniotic fluid index >5 cm. The mean maternal age was 29.0 ± 5.7 years (range, 18-42 years). The median gestational age was 39 weeks (range, 34-42 weeks). The risk factors in 450 pregnant women are shown in Table 1. The incidence of poor perinatal outcome was 16.67%. An intrapartum amniotic fluid index of ≤5 cm, in comparison with >5 cm, is associated with an increased risk of poor perinatal outcome significantly (P <0.05). The sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of four-quadrant

amniotic fluid index ≤5 cm for predicting perinatal outcome were 72%, 89.86%, 58.69%, 94.13%, and 86.88%, respectively (Table 2).

Discussion

Amniotic fluid volume should be assessed either qualitatively or quantitatively at every antenatal ultrasound examination because abnormalities of amniotic fluid volume are associated with a variety of pregnancy complications. Ultrasound techniques used to estimate the adequacy of amniotic fluid volume include the single deepest pocket (SDP), amniotic fluid index (AFI), two diameter pocket, 2 by 1 cm or 2 by 2 cm pocket techniques and subjective assessment. This study showed that an intrapartum amniotic fluid index of ≤5 cm is associated with a significantly increased risk of poor perinatal outcome in high risk pregnancy. The sensitivity, specificity, positive and negative predictive value and accuracy of amniotic fluid index of ≤5 cm for predicting perinatal outcome were 72%, 89.86%, 58.69%, 94.13%, and 86.88%, respectively. Conflicting data have been reported regarding the performance of intrapartum assessment of amniotic fluid volume in the prediction of adverse perinatal outcome.

Table 1 The risk factors in pregnant women.

Risk factors	No.	Percent
Hypertensive disorder	220	48.89
Medical diseases	90	20.00
Diabetes mellitus	73	16.22
Maternal anemia	40	8.89
Growth restriction	27	6.00
Total	450	100.00

Table 2 The results of amniotic fluid index (AFI) for predicting of perinatal outcomes.

AFI (cm)	Perinatal outcomes		Total
	Poor	Good	
≤ 5	54	38	92
> 5	21	337	358
Total	75	375	450

Sensitivity	72.00%
Specificity	89.86%
Positive predictive value	58.69%
Negative predictive value	94.13%
Accuracy	86.88%

The previous study showed the amniotic fluid volumes of 213 pregnant women, assessed subjectively and using the AFI, could predict intrapartum morbidity in a high-risk population.[11] The results showed that both techniques had high specificity and negative predictive values for all outcome measurements, but had poor sensitivity and positive predictive values. One study of 50 pregnancies compared 13 different ultrasound techniques for measurement of amniotic fluid volume to dye dilution-determined amniotic fluid volume. The AFI was superior to all of the other techniques and concordant with dye-determined volume in 71% of cases. However, at low volumes the AFI overestimated dye-determined volumes by 89% and at high volumes AFI underestimated dye-determined volumes by 54%.[12] A systematic review of well-designed randomized trials compared the AFI to the SDP for predicting adverse antepartum, intrapartum, and perinatal outcome and found the AFI was no better than the SDP for predicting an adverse outcome.[13] The AFI diagnosed significantly more cases of oligohydramnios (RR 2.3), which led to significantly more intervention - induction of labor increased two-fold and cesarean delivery increased 1.5-fold - without improving perinatal outcome. Both techniques appear to be poor diagnostic tests for identifying pregnancies that will require cesarean delivery for nonreassuring fetal heart rate tracings or neonatal acidosis.[14] Several studies determined the value of routine intrapartum AFI assessments in determining perinatal outcome in patients admitted for labor and delivery. These authors concluded that intrapartum assessment of amniotic fluid volume by AFI is an effective test to predict adverse neonatal outcome, but use of the AFI increases the number of labor inductions and cesarean deliveries.[7,10,15] In clinical practice, ultrasound estimation of amniotic fluid volume is used in conjunction with other clinical and sonographic assessments (eg, biophysical profile, nonstress test, ultrasound examination for estimated fetal weight, anatomic survey) to provide useful information for managing complicated pregnancies. Therefore, obstetrical ultrasound examinations should include an assessment of amniotic fluid volume by AFI.

In conclusion, an intrapartum amniotic fluid index of ≤5 cm is associated with a significantly increased risk of poor perinatal outcome. The amniotic fluid index measurement is an effective diagnostic test to identify fetus at risk in the intrapartum period of the high risk pregnancy.

References

1. Ingemarsson I, Arulkumaran s, Ingemarsson E. Tambyrja RL, Ratnam SS. Admission test: a screening test for fetal distress in labor. Obstet Gynecol 1986;68:800-6.
2. Sarno AP, Ahn MO, Phelan JP, Paul RH. Fetal acoustic stimulation in the early intrapartum period as a predictor of subsequent fetal condition. Am J Obstet Gynecol 1990;162:762-7.
3. Malcus P. Gudmundsson S. Marsal K. Kwok HH. Vengadasalam D, Ratnam SS. Umbilical artery Doppler velocimetry as a labor admission test. Obstet Gynecol 1991;77:10-6.
4. Sarno AP, Ahn MO, Brar HS, Phelan JP, Platt LD. Intrapartum Doppler velocimetry, amniotic fluid volume, and fetal heart rate as predictors of subsequent fetal distress : an initial report. Am J Obstet Gynecol 1989;161:1508-4.

5. Chauhan SP, Magann EF. Scott JR. Scardo JA. Hendrix NW. Martin JN Jr. Cesarean delivery for fetal distress: rate and risk factors. Obstet Gynecol Surv 2003;58:337-50.
6. Rutherford SE, Phelan JP, Smith CV. The four-quadrant assessment of amniotic fluid volume: an adjunct to antepartum fetal heart rate testing. Obstet Gynecol 1987;70:353-6.
7. Baron C, Morgan MA, Garite TJ. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. Am J Obstet Gynecol 1995;173:167-74.
8. Chauhan SP, Cowan BD, Magann EF. Roberts WE, Morrison JC. Martin JN Jr. Intrapartum amniotic fluid index: a poor diagnostic test for adverse perinatal outcome. J Repro Med 1996;41:860-6.
9. Magann EF, Chauhan SP, Kinsella MJ, McNamara MF, Whit worth NS, Morrison JC. Antenatal testing among 1001 patients at high risk : the role of ultrasonographic estimate of amniotic fluid volume. Am J Obstet Gynecol 1999;180:1330-6.
10. Chauhan SP, Washburne JF, Magann EF, Perry KG, Martin JN. Morrison JC. A randomized study to assess the efficacy of the amniotic fluid index as a fetal admission test. Obstet Gynecol 1995;86:9-13.
11. Williams K, Wittmann BK. The sensitivity and specificity of subjective and semi-quantitive technique of amniotic fluid volume assessment in predicting intrapartum morbidity. Utrasound Obstet Gynecol 1993;3: 180-4.
12. Dildy GA 3rd, Lira N, Moise KJ Jr, Riddle GD, Deter RL. Amniotic fluid volume assessment: comparison of ultrasonographic estimates versus direct measurements with a dye-dilution technique in human pregnancy. Am J Obstet Gynecol. 1992;167:986-94.
13. Nabhan AF, Abdelmoula YA. Amniotic fluid index versus single deepest vertical pocket as a screening test for preventing adverse pregnancy outcome. Cochrane Database Syst Rev 2008:CD006593.
14. Chauhan SP, Doherty DD, Magann EF, Cahanding F, Moreno F, Klausen JH. Amniotic fluid index vs single deepest pocket technique during modified biophysical profile: a randomized clinical trial. Am J Obstet Gynecol. 2004;191:661-7.
15. Kawasaki N, Nishimura H, Yoshimura Y, Okamura H. A diminished intrapartum amniotic fluid index is a predictive marker of possible adverse neonatal outcome when associated with prolonged labor. Gynecol Obstet Invest 2002;53:1-5.