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CLINICAL ARTICLE

The maximal vertical pocket and amniotic fluid index in predicting fetal distress in prolonged pregnancy

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Abstract

Objective: To determine cut-off values for amniotic fluid volume (AFV) predictive of fetal distress in pregnancies 40 weeks or longer, assessed using both amniotic fluid index (AFI) and height of the of maximal vertical pocket (MVP). *Methods*: Amniotic fluid index and MVP were evaluated in 100 women with pregnancies of 40 or more weeks and intact membranes using a 3.5-MHz linear transducer less than 1 week prior to onset of labor. Both measurements were obtained for each participant by the same obstetrician in one sitting. Oligohydramnios was defined as an AFI of 5 cm or less or an MVP of 3 cm or less. External cardiotocography was performed during intrapartum in all cases. Fetal distress was diagnosed when any one of the nonreassuring fetal heart rate pattern occurred or when the Apgar score at birth was 6 or less. The results were analyzed by the χ^2 and the *t* tests. *Results*: An AFI of 5 cm or less was a better predictor of fetal distress than an MVP of 3 cm or less ($P=0.000$). The most statistically significant cut-off values for the occurrence of fetal distress in prolonged pregnancies were an AFI of 8 cm or less (odds ratio, 7.50) or an MVP of 2 cm or less (odds ratio, 2.67). There was a significant correlation between these 2 methods ($r=+0.67$), with a level of significance of 0.01, as shown by the regression curve. The secondary outcome was the statistically significant association between meconium-stained liquor and fetal distress ($P=0.001$). *Conclusion*: In pregnancies of 40 weeks or longer there was a risk of fetal distress when the AFV was 8 cm or less by the AFI method or 2 cm or less as measured by MVP. In such cases, intensive intrapartum monitoring should be performed to prevent fetal jeopardy.

1. Introduction

The intrapartum management of prolonged pregnancies is a unique challenge to the obstetrician, as the perinatal outcome is adverse after 40 completed weeks. In such cases, intrapartum asphyxia and meconium aspiration are associated with almost three fourths of all perinatal deaths [1,2]. Placental dysfunction

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is considered to be the pathophysiologic event leading to intrapartum asphyxia and meconium aspiration. However, the principal mechanism leading to intrapartum fetal distress is umbilical cord compression due to oligohydramnios [3,4]. Therefore, assessing amniotic fluid volume (AFV) may help in predicting fetal distress during the intrapartum.

Various methods were developed to estimate AFV ultrasonographically. One study tested the efficacy of 2 such methods in pregnancies with small-for-gestational-age fetuses, one that determines the amniotic fluid index (AFI) and the other that measures the maximal vertical pocket (MVP), and concluded that an MVP of 3 cm or less was the most useful criterion for predicting fetal distress [5]. These 2 methods, however, have not been adequately evaluated in prolonged pregnancies. The objectives of the present study were (1) to measure AMV by both methods and determine the incidence of oligohydramnios in prolonged pregnancies and (2) to determine cut-off values for MVP and AFI that would be predictive of intrapartum fetal distress in such pregnancies.

2. Patients and methods

The study was conducted with 100 women in the Inpatient Department of Obstetrics and Gynaecology, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry, India, from June 2001 to July 2002. The inclusion criteria were singleton pregnancy of 40 or more weeks (confirmed) and cephalic presentation. Exclusion criteria were premature rupture of membranes, antepartum hemorrhage, multiple pregnancy, congenital fetal anomalies, previous cesarean section, pregnancy-induced hypertension, diabetes mellitus, and hydramnios.

An ultrasonographic device with a 3.5-MHz curvilinear transducer (model SSA-340 A, Toshiba, Tokyo, Japan) equipped with a color Doppler ultrasonographic diagnostic imaging system (Erbis Engineering Co. Ltd., Tokyo, Japan) was used. After informed consent was obtained the participant was placed in supine position and the same obstetrician estimated AFV by the 2 methods.

The AFI was estimated by the 4-quadrant method described by Phelan and colleagues [6]. For measuring MVP the image of the deepest cord-free pool pocket was frozen and measured along its maximum length in centimeters, as described by Manning and colleagues [7]. If the woman was not delivered within 1 week, the measurements were retaken and these final values were used for the analysis.

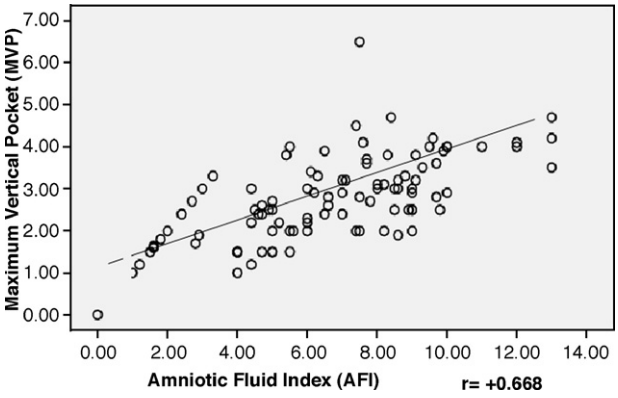

Figure 1 Regression curve.

Oligohydramnios was defined as an AFV of 5 cm or less by the AFI method and 3 cm or less by the MVP method. External cardiotocography was performed in all cases using fetal monitor model 155, V-199 (Corometrics Medical Systems Inc., Wallingford, Connecticut, USA). Fetal distress was diagnosed when a cardiotocogram showed variable decelerations or persistent late decelerations in the fetal heart rate (FHR) or prolonged bradycardia, or when the Apgar score was 6 or less at both 1 and 5 min.

The results were analyzed by the χ^2 and the t tests.

3. Results

The mean gestational age was 41 wks + 4 days and 72% of the participants were primigravidas. The incidence of oligohydramnios was 34% when an AFI of 5 cm or less was considered and 59% when an MVP of 3 cm or less was considered (Table 1). The mean AFI was 6.59 ± 2.91 cm and the mean MVP was 2.74 ± 1.01 cm, and there was a statistically significant correlation between both (r = +0.67, as evidenced by the regression curve) (Fig. 1).

Table 1 Amniotic fluid status and FHR patterns*

Liquor status by method	Normal FHR pattern	Nonreassuring FHR pattern			
		Prolonged bradycardia	Variable deceleration	Late deceleration	Total
By AFI					
< 5 cm (n = 34)†	16 (47)	3 (16.6)	11 of 18 (61)	4 (22.2)	18 (53)
6–8 cm (n = 32)	18 (56)	2 (14.3)	11 of 14 (78.6)	1 (7.1)	14 (44)
> 8 cm (n = 34)	30 (88)	1 (25)	2 of 4 (50)	1 (25)	4 (12)
Total (N = 100)	64 (64)	6 (17)	24 of 36 (67)	6 (17)	36 (36)
By MVP					
< 3 cm (n = 59)†	37 (62.7)	4 (18.2)	14 of 22 (63.6)	4 (18.2)	22 (37.3)
> 3 cm (n = 41)	27 (67.6)	2 (14)	9 of 14 (65)	3 (21)	14 (32.4)
Total (n = 100)	64 (64)	6 (17)	23 of 36 (64)	7 (19)	36 (36)

Abbreviations: AFI, amniotic fluid index; FHR, fetal heart rate; MVP, maximum vertical pocket.
*Values are given as number (percentage).
†Oligohydramnios.