Determining a Threshold for Defining Oligohydramnios in a Low-Risk Population at Term

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Determining a Threshold for Defining Oligohydramnios in a Low-Risk Population at Term

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Abstract:

Objective

To determine if a certain low level of amniotic fluid incidentally found in low risk term pregnancies is predictive of adverse perinatal outcome.

Study Design

Prospective cohort study of patients at 37-40 weeks gestation during 2004-2008 at the Hospital of the University of Pennsylvania (n=195) and Lehigh Valley Health Network (n=113). Pregnancies were uncomplicated and antenatal testing was otherwise not indicated. Amniotic fluid was quantified by the AFI 4-quadrant technique and was repeated weekly until 40 weeks. Clinicians and patients were blinded to AFI levels except if the AFI ≤ 1 cm or ≥ 25 cm. Primary outcome was a positive Fetal Vulnerability Index (FVI). The last AFI measured was evaluated as a predictor of a +FVI.

Results

308 patients met criteria for study analysis. Mean gestational age on admission was 39.8 weeks (range 37.2-41.6 weeks). Mean AFI measured closest to delivery was 11.4 (± 3.5 cm). 2% (n=6) had AFIs < 5 cm before delivery; 15.6% (n=48) had AFIs < 8 cm before delivery. 7.8% (n=24) of patients delivered a neonate with a +FVI. There were no fetal or neonatal deaths. Last AFI level was 10.2 (± 3.4 cm) among pregnancies with a positive FVI vs. 11.5 (± 3.5 cm) among those with a negative FVI (p=0.07). An AFI < 8 increased the risk of a +FVI by almost 3-fold (risk ratio 2.70 [95% CI 1.2, 6.0]; p=0.01). Using an AFI cutoff of < 8 cm, the area under the receiver operating characteristics (ROC) curve was 0.59, with a sensitivity of 33.3% and a specificity of 85.8%. Delivery mode, intrapartum complications and neonatal resuscitation were similar by AFI levels.

Conclusion

An AFI cutoff <8 cm was associated with an increased number of +FVI outcomes yet was not a strong predictor of a +FVI. Our data suggest that the incidental finding of low amniotic fluid, in otherwise uncomplicated low risk patients, may not be an indication for immediate intervention. Larger prospective studies are needed to further evaluate this question.

Materials and Methods:

A prospective cohort study was performed by recruiting patients attending prenatal clinic between 37 and 40 weeks' gestation.

Inclusion criteria:

- women with a singleton intrauterine pregnancy
- nulliparous and multiparous patients
- size equal to dates on clinical exam
- documented adequate prenatal care with well-established dates
- intact membranes

Exclusion criteria:

- multiple gestations
- pregnancies at less than 37 weeks' or greater than 40 1/7 weeks' gestation
- known oligohydramnios prior to 37 weeks' gestation
- women with medical or obstetric complications
- fetuses with congenital anomalies and/or intrauterine growth restriction
- diagnosis of ruptured membranes, placental abruption or pre-eclampsia at enrollment

Post-enrollment exclusion criteria included pregnancies diagnosed with severe oligohydramnios (AFI ≤ 1cm) or polyhydramnios after the ultrasound. If the amniotic fluid was less than 5 cm, a biophysical profile was performed. The patient was to be excluded from enrollment if the biophysical profile was less than 6/8. AFIs remained blinded if the score was 6/8.

The amniotic fluid volume was measured sonographically by research nurses. Amniotic fluid was quantified by the AFI four-quadrant technique. The AFI was repeated weekly until 40 weeks' gestation if the patient was undelivered.

Clinicians were blinded to the AFI levels. Any AFI less than 1 cm was disclosed to the clinicians for further management. AFI levels less than 5 cm were revealed to the clinicians if the patient was exactly 40 weeks gestation at the time of ultrasound.

Primary outcomes:

- neonatal outcome, assessed by the Fetal Vulnerability Index (FVI). A positive FVI was defined in a previous study but modified for our study as the presence of one or more of these factors
  - five minute Apgar ≤ 3
  - umbilical cord pH ≤ 7
  - intrapartum fetal death
  - neonatal death
  - neonatal seizures
  - intubation in the absence of meconium
  - neonatal ICU admission for greater than 24 hours

Neonates who experienced more than one component were represented only once in the outcome analyses.

Since our aim was to select a threshold for an AFI in predicting a positive fetal vulnerability index (FVI), we desired a test with a sensitivity of 80%. We estimated that 10% of women deliver a neonate with a positive FVI. Basing our sample size on the half width of the 95% confidence interval around the sensitivity estimate, we calculated that we need to perform ultrasounds on 620 women, 62 of which should have a positive FVI.

Receiver Operating Characteristic (ROC) curves were created to determine if there is a threshold at which an AFI is predictive of a positive FVI. In patients with more than one AFI level, we used the level closest to delivery.

Results:

308 patients met criteria for study analysis. Table 1 describes the patient population. Table 2 describes the outpatient and admission characteristics.

Table 1. Patient Population (n=308)

Maternal age	23.2 ± 5.2 years
Gravidity (median)	2 (1-9)
Multiparous	154 (50.0%)
Race (African American vs. other)	189 (61.6%)
Insurance (Medicaid vs. other)	258 (85.4%)

Table 2. Outpatient and Admission Characteristics

Gestational age at dating sonogram	16.1 ± 6.0 weeks
EDC changed by first sonogram	108 (35.64%)
Gestational age at first visit	14.7 ± 5.7 weeks
Gestational age at study entry	38.1 ± 0.9 weeks
Gestational age at time of admission	39.8 ± 1.0 weeks
Mean AFI at time of last sonogram	11.4 ± 3.5 cm
Number of patients with AFI < 8cm	48 (15.6%)
Number of patients with AFI < 5 cm	6 (2%)

7.8% (n=24) of patients delivered a neonate with a positive FVI (22 positive due to NICU admissions for greater than 24 hours, 2 for umbilical cord pH less than or equal to 7, and 1 for intubation without meconium). There were no fetal or neonatal deaths. Mean AFI level was 10.2 (± 3.4 cm) among pregnancies with a positive FVI vs. 11.5 (± 3.5 cm) among those with a negative FVI (p=0.97).

An AFI < 8 cm increased the risk of a positive FVI by almost 3-fold (17% positive FVI with AFI < 8 cm vs. 6.2% positive FVI with an AFI ≥ 8 cm, risk ratio 2.70 [95% CI 1.2, 6.0]; p=0.01). FVI outcomes were not different when the AFI was less than 5 cm (16.7% positive FVI with AFI < 5 cm vs. 7.6% positive FVI with an AFI ≥ 5 cm, risk ratio 2.19 [95% CI 0.4, 13.7]; p=0.41).

Using AFI < 8 cm, the area under the receiver operating characteristics (ROC) curve was 0.59, with a sensitivity of 33.3% and a specificity of 85.8%. Using an AFI < 5 cm, the area under the receiver operating characteristics (ROC) curve was 0.51, with a sensitivity of 4.2% and a specificity of 98.2% (Figure).

Delivery mode, intrapartum complications and neonatal resuscitation were similar by AFI levels at either cutoff of 5 or 8 cm (Table 3). The use of intrauterine resuscitation techniques was also similar by AFI level, 30.6% with AFI ≥ 8 cm vs. 34.8% with AFI less than 8 cm (p=0.58).

Figure 1. Receiver operator characteristic curves by level of AFI

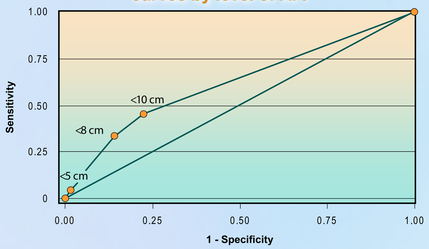

Table 3. Secondary outcomes by AFI level

Secondary Outcomes	AFI ≥ 8 cm (n=260)	AFI < 8 cm (n=48)	p value
Delivery mode	65 (25.0%)	12 (25%)	1.0
Intrapartum complications	44 (16.9%)	13 (27.1%)	0.10
Postpartum complications	23 (8.9%)	2 (4.2%)	0.28

Conclusions:

In our prospective cohort study, an AFI cutoff <8 cm was associated with an increased number of positive FVI outcomes yet was not a strong predictor of a positive FVI. Our data suggest that the incidental finding of low amniotic fluid, in otherwise uncomplicated low risk patients, may not be an indication for immediate intervention particularly in the setting of a low Bishop score. Larger prospective studies are needed to further evaluate this question.