
Significance of Ultrasound Measurements of the Head of the Breech Fetus

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Ultrasound measurements of head shape and size in 451 fetuses presenting as a breech were compared to those obtained in 1,880 fetuses presenting as a cephalic between 15 and 40 weeks' gestation. No statistically significant differences were found for the biparietal diameter (BPD), head circumference (HC), or cephalic index (CI) measurements between the two groups in uncompli-

cated pregnancies. The mean values for the CI were found to be lower for breech presenting fetuses in complicated pregnancies, indicating a trend for these fetuses to have a more dolichocephalic head shape. **KEY WORDS:** biparietal diameter; gestational age; breech presentation. (*J Ultrasound Med* 6:437, 1987)

A number of authors have suggested that a fetus presenting as a breech may have a head shape different from a fetus presenting as a cephalic.¹⁻³ Sonographic estimation of gestational age (GA) is most commonly made by biparietal diameter (BPD) measurements; therefore, any difference in head shape might be expected to influence such assessment. Since a breech presentation is more common in the patient with fetal anomalies, premature labor, and premature rupture of membranes (PROM), accurate assessment of GA may be critical for optimal patient management. It is therefore essential to determine whether BPD values derived from cephalic presenting fetuses may be applied to the breech presenting fetus, or if separate growth curve charts are necessary. This study was undertaken to determine whether there are any differences in head shape and size in these two groups and if any such differences might influence GA assessment.

MATERIAL AND METHODS

The initial database consisted of all obstetrical ultrasound examinations performed during 1983-1984 in our laboratory. Measurement data from each pregnancy were collected at the time of examination, stored on a computer file, and subsequently merged with the clinical data file in the Perinatal Data Registry, coded at the time of the patient's discharge from the hospital. This allowed cross-referencing of the ultrasound data with clinical outcome. If more than one ultrasound examination had been performed on any fetus, only the last examination was chosen for analysis to insure statistical independence and to maximize the number of third trimester measurements.

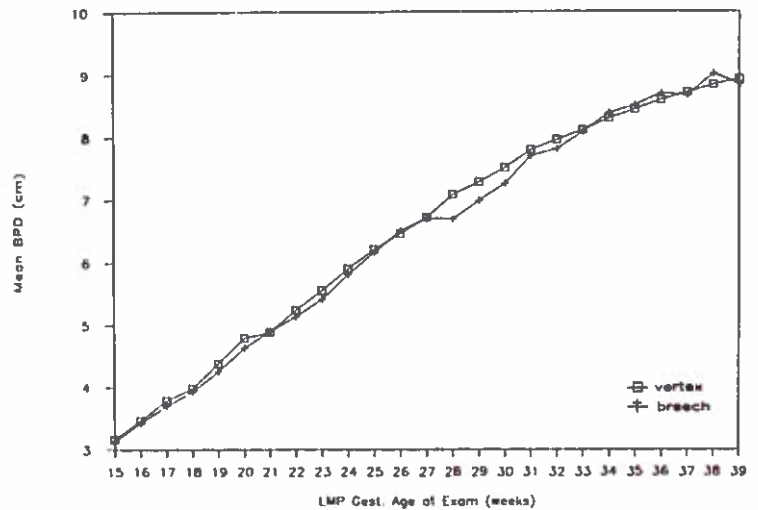
Criteria for selection in this study included: singleton pregnancy from 15 to 40 weeks' GA, known last normal menstrual period, GA at delivery agreed with neonatal assessment of GA by Dubowitz scoring, and delivery occurred at our institution. Stillbirths were excluded. A retrospective study was performed on a total of 2,331 fetuses, 451 of which presented as a breech and 1,880 as a cephalic.

At each examination, BPD was measured from leading edge to leading edge at the level of the thalami and cavum septi pellucidi. The occipitofrontal diameter (OFD) and head circumference (HC) were obtained at

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Figure 1 Comparison of the biparietal diameter measurements of vertex presenting fetuses to breech presenting fetuses.



the same level. The cephalic index (CI) was measured using the formula $CI = BPD/OFD \times 100$ as described by Hadlock.⁴ Measurements were obtained using several commercially available linear array and sector real-time units equipped with 3.5-MHz transducers. Calculations were made by use of a digitizer pad.

RESULTS

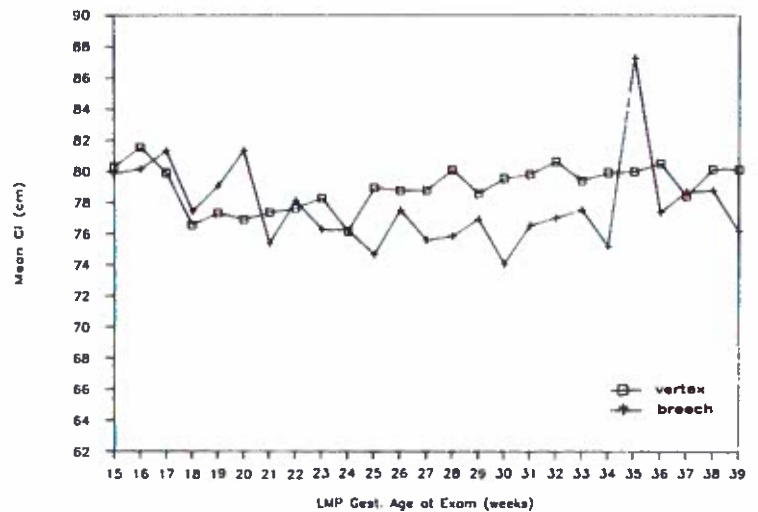
Mean values for BPD, OFD, HC, and CI were calculated and plotted at weekly intervals from 15 to 39 weeks for each group. Visual inspection of the BPD graph shows the BPD mean values in the breech group to be 0.5 to 2 mm smaller than the cephalic group until 33 weeks, and then up to 1 mm larger from 33 to 39 weeks (Fig. 1). The breech group CI means tended to be smaller than the means for the cephalic group. Although some individual

data points fell outside of Hadlock's normal range for cephalic index (range, 74-83) for both the breech and cephalic groups, all of the means fell above 74.

A two-way analysis of variance was performed with GA and presentation as factors. As would be expected, the GA factor was highly significant for all four fetal measurements since it represents a function of fetal growth over time ($P < 0.001$). Only the CI was found to be significantly associated with the presentation factor ($P < 0.001$). The interaction between GA and presentation was not significant for any measurement.

To determine whether the statistical significance of the presentation factor in the CI measurements resulted purely from fetal presentation or from a combination of presentation and maternal/fetal complications, the total study group was divided into two subgroups: "complicated" and "uncomplicated" pregnancies. The criteria for inclusion in the complicated group were: PROM,

Figure 2 Comparison of the cephalic index of vertex presenting fetuses to breech presenting fetuses in complicated pregnancies.



labor, abruption, intrauterine growth retardation, fetal anomaly, polyhydramnios or oligohydramnios, drug and alcohol abuse, maternal diabetes, and hypertension.

A total of 1,299 fetuses (259 fetuses presenting as breech and 1,040 fetuses presenting as cephalic) was available for comparison in the "uncomplicated" group. A two-way analysis of variance again showed the GA factor to be highly significant for all four of the fetal parameters measured ($P < 0.001$), but yielded no significant differences for presentation or in the interaction between GA and presentation.

The "complicated" group consisted of 1,032 fetuses (192 fetuses presenting as breech and 840 fetuses presenting as cephalic). An analysis of variance once again showed the GA factor to be significant for all four parameters ($P < 0.01$). For presentation, only the CI was significant ($P = 0.009$), as shown in Fig. 2. The interaction between the GA and presentation was statistically significant in all four measurements ($P < 0.05$).

DISCUSSION

Measurement of the BPD is an integral part of an obstetrical ultrasound examination, and its relationship to GA is well documented. The applicability of a BPD measurement for assessment of the GA in any particular patient will depend on a number of factors, including the stage of pregnancy at which it was obtained, the measurement technique used, and the population from which the reference chart was obtained. That fetal presentation might influence head shape and thus the measurement parameters one would obtain was proposed by Haberkern et al.¹ In this study, eight infants born in the breech presentation were considered to have an elongated and narrow skull with prominent occipital shelving. This unusual shape was suggested as being secondary to the "forces applied to the growing cranium by the uterine fundus." Measurements were not obtained. The incidence of this unusual shape in the breech population (or for that matter, in the cephalic presentation) and to what extent this cranial shape might be due, at least in part, to force sustained during labor and delivery cannot be determined from this study.

Aantaa and Forss² reported a study comparing ultrasound cranial measurements of vertex presenting fetuses to those obtained from breech presenting fetuses. They found that BPD measurements were statistically smaller in the breech group than in the vertex group, especially after the 28th week, when the differences

averaged from 1 to 2 mm. A study performed by Kasby and Poll,³ in which neonatal BPDs were measured between 12 and 48 hours postpartum, showed that the mean BPD of the breech infant was 1.2 mm smaller than that of the cephalic infant. The neonatal mean BPDs of the cephalic group were stated to be compatible with the sonographic BPD charts published by Campbell and Newman in 1971.⁵

To obtain the most accurate assessment of the GA from a biparietal diameter (or any other parameter) requires that the patient in question conforms as closely as possible to the population used for the derivation of one's "normal" population. Factors such as PROM, premature labor, and oligohydramnios are predisposing to a dolichocephalic head shape, and may cause a GA discrepancy secondary to head shape rather than head size.⁶

CONCLUSIONS

Appropriate BPD charts in current use may be utilized in uncomplicated pregnancies for both breech and cephalic presenting fetuses since the mean measurements for the BPD, CI, and HC in this subgroup showed no statistically significant differences. In situations in which there are factors which predispose alteration of head shape toward dolichocephaly or brachycephaly, e.g., PROM, premature rupture of membranes, or oligohydramnios, a composite GA utilizing HC, abdominal circumference, and femur length may be more appropriate for GA assessment.

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