

ESTIMATION OF FOETAL WEIGHT BY ULTRASOUND

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SUMMARY

Accurate estimation of Foetal Weight has a significant bearing in the management decision in labour and can improve the perinatal outcome significantly. There has been continuous search for developing methods that will provide reliable information of foetal size and which can be used to screen large number of patients. Ultrasonographic estimation of foetal weight is so far the best available method.

Introduction

Perinatal morbidity and mortality is affected by both foetal age and foetal weight. Perinatal mortality and morbidity is increased for both SGA (Small for gestational age) and Large for gestational age (LGA) foetus.

Foetal weight estimation has therefore become increasingly important specially under the following conditions:-

- 1) Where delivery of pre-term baby is anticipated so that the time of intervention can be planned.
- 2) In cases of intrauterine growth retardation.
- 3) Mode of delivery is Breech presentation.

- 4) Induction of labour before term in completion of pregnancy.

The methods of estimating foetal weight available are those based on palpation of maternal abdomen, length of fundus and those utilizing foetal measurements as obtained by X-ray or Ultra sound. Any method that provides reliable information of foetal size and which can be used to screen large number of patients will be a potent factor in reduction of perinatal death and morbidity. Ultrasonography estimation of foetal weight is so far the best available method.

Material and methods

A study of 100 patients was carried out in Dept. of Obstetrics & Gynaecology, GMC, Bhopal. Patients in whom delivery

was anticipated within 24 hours were selected for study.

Foetal weight (FW) was estimated using Dawn's formula utilizing external measurements of uterus and ultrasonic parameters viz. Biparetal diameter (BPD), Abdominal circumference (AC), and combined AC and BPD. Baby was immediately weighed after delivery. 1 min. and 5 min. Apgar Scoring was done. Difference between estimated weight and actual weight was calculated.

Instrument

The diagnostic ultrasound instrument used in the examination was ADR (Advanced Diagnostic Research) 4000 Sector/Linear Real time Ultrasound system.

Formula used for calculating foetal weight:

I. Dawn's Formula.

$$FW = 1.44 \times L \times (1/2T)^2$$

L Maximum vertical length of uterus.

T Maximum transverse diameter of uterus.

II. BPD:- FW = 770 BPD - 4100

III. Abdominal Circumference (AC):

$$\text{LogBW} = -1.8367 + 0.092 (\text{AC}) - 0.019 (\text{AC})^3/1000.$$

IV. Combined use of BPD & AC :

$$\text{LogBW} = -1.7492 \times 0.166 (\text{BPD}) + 0.046 (\text{AC}) - 2.646 (\text{AC}) (\text{BPD})/1000$$

Observations and Results

Present study was an analysis of equations for prediction of foetal weight in utero. Weight range of birth weight predicted by Dawn's formula was 1843 to 3969 gms, by BPD 1983 to 3292 gms, by AC - 1563 to 3746 gms and by combined use of AC & BPD - 1522 to 3711 gms.

I. Estimation of foetal weight by Dawn's formula:

In present study 14% of estimates were within 5% of actual birth weight (ABW) 48% within 10% of ABW and 57% in 15% or more actual birth weight. Whereas in Dawn's (1983) 100% were within 10% of actual birth weight. In Johnson and Tosach's study it was 50.5% within 240 gms while in Polus and longstand's (1953) study it was 68% within ± 250 gms.

II. Estimation of foetal weight by BPD:

In present study 20% of estimates were within 5% of actual birth weight, 48% within 10% of ABW and 52% fall in 15% or more of ABW. 82% of estimates were within ± 400 gms, whereas in the study of Sabhaga & Turner (1972) 95% of estimates within ± 400 gms, Iannirubesto & Gibbons (1971) found it to be 95% within ± 368 gms, while Stocker (1974) found it 95% within ± 652 gms.

III. Estimation of foetal weight by BPD & AC:

In present study 59% of estimates were within 10% of actual birth weight whereas in Warsof study 54.8% were within 10% of ABW and Shepard's study 50.7% were within 10% of ABW.

TABLE 'A'
COMPARISON OF RESULT OF PRESENT STUDY BY DIFFERENT PARAMETERS

Parameter	Mean (gms)	Standard deviation (gms)	Standard error of mean in (gms)
1) Dawn's formula (External measurements of uterus)	249.19	214.57 gms or 82.099 gm/kg.	21.45
2) BPD	119.81	292.09 or 102.84 gms/kg.	29.209
3) AC	-45.66	263.82 or 102 gm/kg.	26.382
4) BPD & AC	-45.60	236.87 or 90.87 gms/kg.	23.687

TABLE 'B'

Parameter	Percentage of estimates within 10% of ABW
1) Dawn's formula	43%
2) BPD	48%
3) AC	54%
4) BPD & AC	59%

Combined use of BPD and AC is a better method of predicting foetal weight in utero.

Discussion

Accurate estimation of foetal weight can have a significant bearing on the management decisions in labour and can improve the perinatal outcome significantly. In case of preterm labour with inaccurate estimation of foetal weight a potentially salvable foetus may die if it is assessed to be too small for aggressive management of distress in utero or on the other hand caesarean section may be per-

formed on a foetus which has no reasonable chance of survival. Large foetus weighing more than 3500 gms if identified accurately and presenting by breech will be better served by caesarean section. A significant discrepancy among the weights of the foetus in twin pregnancy with the larger second fetus presenting by breech will favour decision for an abdominal delivery. An accurate prediction of foetal weight will help in production of IUGR fetuses at an early period of gestation.

Palpation of the abdomen for estimation of foetal weight has proved unsatisfactory because differences in tissue thickness, the amount of amniotic fluid and many other variable make it impossible to estimate foetal size to a closer than 2 pounds of the actual weight in many instances.

Radiology has not contributed appreciably to the solution of this problem because of its hazards.

Foetal weight estimation by external measurements of uterus is an indirect method.

Recently Ultrasound has created a new approach to this problem. The technique appears uniformly accurate through the entire range studied. The volume of amniotic fluid present, placental location or presentation of the fetus does not influence the ability to accurately assess foetal weight. Additionally the technology is available to the obstetrician with a medium of real time ultrasound experience and can be performed in labour and delivery. The information is available almost immediately for clinical use in the obstetric management plan when the delivery of the very low birth weight infant threatens.

References

- 1) Dawn CS, *Text Book of obstetrics.*
- 2) Ianniruberto, John : *Obstet. Gynaec.* 37, 689, 1971.
- 3) Johnson RW, Tosache : *Am obstet. Gynaecol.* 68 : 891, 1954.
- 4) Polus P.P., Longstadt J.R., *Am.J. Obstet. Gynaec.* 65 233, 1955.
- 5) Sabagha RE, Turner Hj. *Am. J. Obstet. Gynaec.* 40 : 741, 1972.
- 6) Shepard : MJ, Richards, VA, Berkowitz RL, Warsof SL and Hobbins JC : *Am.J. Obstet. Gynaec.* 142 : 47, 1982.
- 7) Stocker J., Maware., Delcon A., Desjar Dins. P., *Am. J. Obstet. Gynaec.* 42 : 275, 1974.
- 8) Warsof S, Gohari P, Berkowitz, Hobbins JC : *Am.J. Obstet. Gynaec.* 128 : 881, 1977.