



Ultrasonic obstetric conjugate measurement : a practical pelvimetric tool

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OBJECTIVE(S): To assess obstetric conjugate ultrasonically at term in the labor room setting, and to study its relationship with mode of delivery, maternal height and neonatal weight.

METHOD(S): Fifty-five women at term, in early labor or admitted for induction of labor, entered the study. Longitudinal ultrasonic scanning by transabdominal 3.5 MHz curvilinear probe was performed for measurement of obstetric conjugate from a site most adjacent to pubic symphysis to the sacral promontory. Based on this obstetric conjugate measurement, women were divided into three groups namely those with obstetric conjugate < 10 cm, 10.1-12 cm, and > 12 cm. Mode of delivery was noted and maternal height and neonatal weight were correlated with ultrasonic obstetric conjugate. Ordinary least square method and logistic regression analysis were used for statistical analysis.

RESULTS: The mean age of the women was 22.65 ± 3.14 years and mean height 149.11 ± 6.72 cm. The cesarean delivery rate was 50%, 3.12%, and 11.7% when ultrasonic conjugate was < 10 cm, 10.1-12 cm, and >12 cm respectively. A positive relationship was found between maternal height and obstetric conjugate. Results from regression analysis show that maternal height determines ultrasonic obstetric conjugate significantly ($P < 0.001$). A good relationship between neonatal weight and ultrasonic obstetric conjugate was also obtained ($P < 0.001$), with an elasticity of 0.47.

CONCLUSION(S) : Ultrasonic obstetric conjugate measurement is a simple, noninvasive and safe method of assessing the anteroposterior diameter of the pelvic inlet. An ultrasonic obstetric conjugate of less than 10 cm should alert the obstetrician for a possibility of cesarean delivery.

Key words : pelvimetry, ultrasonic obstetric conjugate, cesarean delivery, maternal height

Introduction

Normal morphological features of the maternal pelvis are an important prerequisite to vaginal delivery. Clinical evaluation and radiopelvimetry are the accepted methods of evaluation of the maternal pelvis. But, while the clinical method is associated with a subjective error, radiopelvimetry is cumbersome and associated with radiation hazard to the fetus^{1,2}. Magnetic resonance

imaging (MRI) for pelvimetry carries no radiation exposure but is expensive, time consuming, technically demanding, and not suitable during labor³. The ultrasonic measurement of obstetric conjugate (UOC) is stated to be simple, cost-effective, and clinically useful in women with suspected inlet contraction⁴. The utility of ultrasound pelvimetry has been determined in the present study.

Method

A prospective nonrandomized study was done on 55 women at term admitted to the labor ward in early labor or for induction of labor from August 2000 to January 2001. The hospital ethical committee had approved the study and informed consent was obtained from the women.

Forty consecutive primigravidas and 15 multigravidas with

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abnormal presentation, doubtful clinical pelvimetry findings, and previous cesarean section or history of previous difficult delivery were included in the study. Each woman was subjected to clinical and ultrasound examination. Age, height, parity, and clinical pelvimetry findings were noted. Depending upon height, women were divided into 3 groups i.e., height ≤ 140 cm, between 141 and 150 cm, and ≥ 151 cm.

A transabdominal ultrasonic scan was done using Logic™ 500MRS PLUS (WIPRO GE) ultrasound machine. A 3.5 MHz transabdominal curvilinear probe was used for the measurement of the obstetric conjugate. Longitudinal tomographic imaging was performed at a site most adjacent to the pubic symphysis above the pubic bone on left or right side. A radial acoustic shadow with a bright echo at the superior periphery of pubic bone was observed. The internal end of the superior periphery of pubic bone to sacral promontory was measured as the UOC as described by Katanozaka et al⁴ (Figure 1).



Figure 1. Ultrasound picture showing bright acoustic shadow of pubic symphysis, sacral promontory, ultrasonic obstetric conjugate, and biparietal diameter entering pelvic inlet.

Based on the obstetric conjugate measurement, women were divided into three groups viz., A B and C having UOC < 10 cm, 10.1-12 cm, and > 12 cm respectively. The mode of delivery, indication for cesarean section when needed, and birth weight were recorded.

The relationships between obstetric conjugate and mode of delivery, and maternal height and birth weight were evaluated statistically. Statistical methods used were ordinary least

square method and logistic regression analysis, and a correlation between these parameters was attempted.

Results

The age of the women ranged between 18 and 30 years with a mean of 22.65 ± 3.14 years. 10.9% were teenagers. Primigravidas constituted 72.73% (40/55). Out of 15 multiparas five had doubtful clinical pelvimetry findings, four had previous cesarean delivery, one was admitted with breech presentation, and five had a history of a previous difficult delivery. The height of the patients ranged between 135 and 166 cm with a mean of 149.11 ± 6.72 cm. The UOC varied from 9.4 to 12.9 cm with a mean of 11.4 ± 1.07 cm. The distribution of women into Groups A, B and C was 10.9% (6/55), 58.18% (52/55), and 30.9% (17/55) respectively.

The cesarean delivery rate was 10.9% (6/55) while the forceps delivery rate was 5.4% (3/55). Forty-six women had a normal vaginal delivery. Cesarean delivery for dystocia recorded in groups A, B and C was 50% (3/6), 3.12% (1/32), and 11.7% (2/17) respectively (Figure 2) i.e., 50% of woman with UOC < 10 cm had to undergo cesarean delivery which was much higher than the cesarean delivery rate in the other two groups. But the number of cesarean deliveries was too small for arriving at statistical significance.

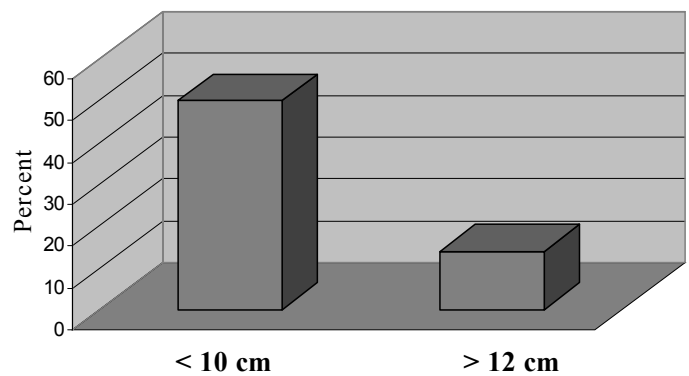


Figure 2. Obstetric conjugate and cesarean delivery.

Regression analysis was carried out to examine the relationship between maternal height and obstetric conjugate. Maternal height correlated linearly with UOC (Figure 3). Results from regression analysis show that maternal height determines UOC significantly at 1% level of significance ($P < 0.001$), which means that a 10% change in maternal height would change UOC by 10.1%. In patients with UOC less than 10 cm the likelihood of having a cesarean delivery was 50% but statistical significance could not be derived, as the numbers undergoing cesarean section in different group were small.

A relationship between birth weight and UOC was determined and a linear correlation was seen ($P < 0.001$) (Figure 4). A 10% change in UOC influences neonatal weight by 4.7%. The mean weight of the neonates was 2.77 ± 0.35 kg and there was no perinatal mortality or morbidity.

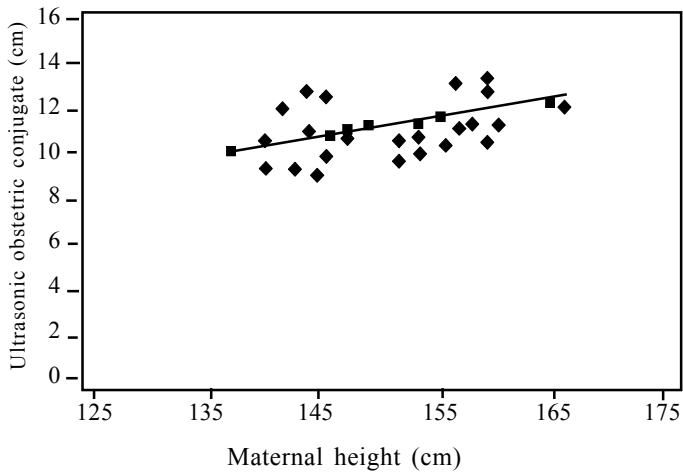


Figure 3. Relationship of ultrasonic obstetric conjugate with maternal height.

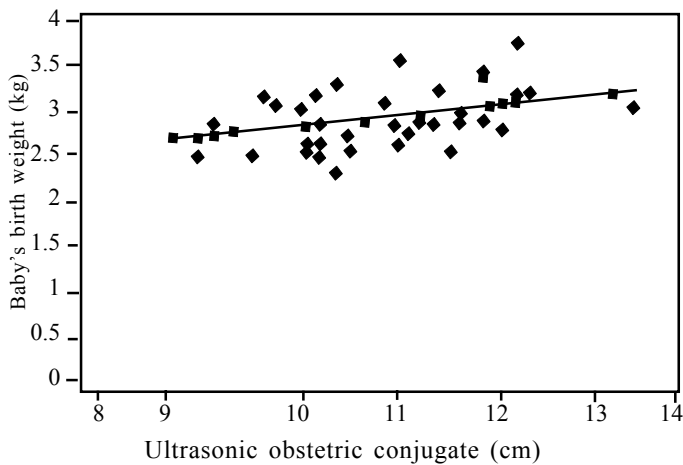


Figure 4. Birth weight vs ultrasonic obstetric conjugate.

Discussion

Contracted pelvis and cephalopelvic disproportion involving an absolute or relative mechanical disparity between the fetal size and birth canal continue to be a serious cause of maternal and perinatal morbidity and mortality ⁵. The best preventive measure for contracted pelvis associated morbidity and mortality is timely cesarean section. The pelvic inlet is considered to be contracted if its shortest anteroposterior diameter is less than 10.0 cm and the transverse diameter is

less than 12 cm ⁶. When both diameters are contracted the obstetric difficulty further increases. Cesarean section rate in women with obstetric conjugate < 10 cm was higher i.e. 50% (3/6) vs 6.1% (3/49) than that with obstetric conjugate > 10 cm. Katanozaka et al ⁴ report a 50% incidence of cesarean delivery in women with obstetric conjugate less than 12 cm and 7.1% in those with obstetric conjugate more than or equal to 12 cm. The probable reason for this difference from our study might be racial or due to a disparity in birth weight in the two studies. Statistical significance between UOC and cesarean section rate could not be derived because of the small number of women undergoing cesarean section in our study (6/55). An exploration into this issue requires expansion of sample size. The mean ultrasonic obstetric conjugate in our study is 11.4 ± 1.07 cm while that reported by Katanozaka is 12.90 ± 0.88 cm.

It is conventionally said that a smaller woman is likely to have a smaller pelvis ⁷. Height has been correlated with pelvic size and employed to predict cephalopelvic disproportion by other workers also ⁸⁻¹⁰. However some authors have said that maternal height is a poor predictor of cephalopelvic disproportion ¹¹.

Obstetric conjugate also influenced birth weight to some extent. Birth weight was lower in women with a smaller UOC. Although this finding suggests an indirect influence of maternal size on birth weight, no definite conclusion can be drawn, as birth weight is dependent on a number of other variables.

Conclusion

Evaluation of UOC is a simple, feasible, noninvasive, and inexpensive method to assess pelvic inlet. It assists in making rational decision about the mode of delivery in many cases. Ultrasonic conjugate measurement would be valuable in cases of suspected inlet contraction, nonprogress of labor with failure of the head to descend, previous prolonged labor, and prior cesarean birth. It can be done at the bedside of the laboring woman and does not involve radiation exposure.

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