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# Experience with computed tomography (CT) pelvimetry in Ibadan, Nigeria: a preliminary report

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**Summary**
Computed tomography (CT) pelvimetry has largely replaced conventional radiography in the antenatal assessment of pelvic dimensions, but its usefulness in the Nigerian setting is yet to be assessed. This study was undertaken to ascertain if there is a relationship between antenatal CT pelvimetric measurements and the mode of delivery at the end of the pregnancy A group of thirty-one patients who had antenatal pelvimetry were categorised into two groups depending on whether they achieved vaginal delivery or not and the pelvimetric and other obstetrrc characteristics of the two groups were compared. The only parameters that showed statistieally significant differences between the groups were the higher maternal height and the lower head circumference in the neonates of women achieving vaginal delivery. The findings suggest that fetal parameters may be more predictive of mode of delivery than absolute pelvic measurements.

**Keywords:** *Pelvimetry, computed tomography, labour outcome.*

**Résumé**
La tomographie (CT), pelvimetrie informatise a largement remplace la radiographie conventionelle, dans l'evaluation antenatale des dimentions pelvique, mais son utiulite dans le don texte Nigeria est encore a evalue cettle etude avail ete faite pour verifier si il ya une relation tentre les mesures pelvimetrique antenatale (CT) et le profile d'accouche ment a la fin de la grossesse. Un groupe de trente un patients qui avait eu une pelvimetrie antenatale avail ete categorise en 2 groups dependent de si elle avaient fait un accounchement vaginal ou pas, et la pelvimetrie et d'autres characteristique obstetrique des 2 groupes avaient ete comprises. Les seuls parametres qui avaient montre des differences statisque significative entre les 2 groupes etaient la grande taille maternelle et la faille de la circonference de la tete chez les naiveaux nis des femmes ayant un accouchement vaginale. Ces resultats suggerent que les parametres feetdux pourraient etre plus predictif du mode d'accouchement par rapport aux mesures du pelvic.

## Introduction

The difficulties in making an accurate assessment of pelvic dimensions have been recognised for a long time [1]. One approach that offered an objective appraisal was the use of X-rays, a development that paved the way for the widespread adoption of radiological pelvimetry. Currently, pelvic dimensions can be maeasured using conventional radiography, computed tomography (CT) and magnetic resonance imaging (MRI)

The introduction, in the early 1980s, of CT-pelvimetry [2] was significant improvement over the conventional techniques of radiological measurements. Evidence also abounds that CT-pelvimetry results in a reduction in the level of exposure to ionising radiation compared to conventional radiography [3]. Nonetheless, CT-pelvimetry still involves the use of ionising radiation and the potential hazards of this to the fetus mandates a careful evaluation of the information the technique provides. This preliminary report on the pelvimetric dimensions of thirty-one consecutive patients who had CT-pelvimetry in a Nigerian university teaching hospital over a four-year period is directed at meeting this need.

The main objective of this study was to analyse the pelvimetric data obtained from the patients in order to ascertain if there is any relationship between the CT-pelvimetric dimensions and the outcome of labour. An attempt was also made to assess the impact of fetal parameters such as birthweight, head circumference and fetal length on such a relationship.

## Materials and methods

The pelvimetry data of 31 consecutive patients referred for antenatal CT-pelvimetry over a four-year period (1994-1998) and who were allowed to go into labour were retrieved for analysis. Patients who were scheduled for elective caesarean section after pelvimetry were excluded from the analysis. The views utilised for pelvimetric measurements were the lateral scanograms (Fig. 1), antero-posterior (AP) scanogram (Fig. 2) and a single axial slice (Fig. 3). The AP inlet was

**Fig. 1:** Lateral scanogram: This measures the antero-posterior inlet from the sacral promontary to the pubic symphysis

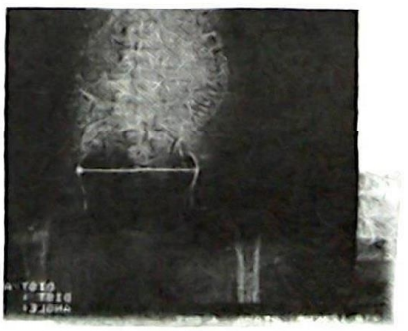

**Fig. 2:** Antero-Posterior scanogram: This measures the transverse diameter as the distance between the pelvic walls

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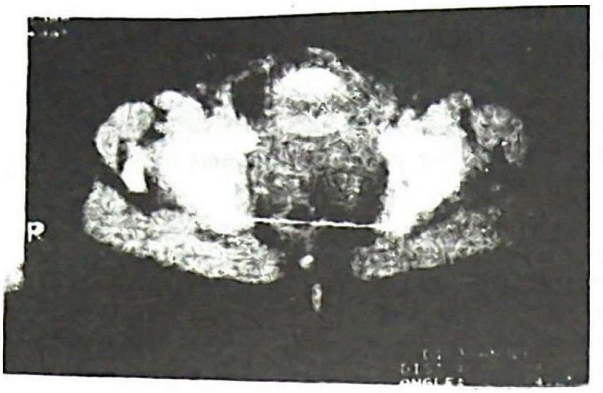

**Fig. 3:** The single axial slice through the fovea of the femoral head. It measures the interspinous diameter between the ischial spines

measured on the lateral scanogram as the distance from the sacral promontory to the pubic symphysis. The transverse diameter was measured on the AP scout-view as the distance between the pelvic walls. The interspinous diameter, the distance between the ischial spines, was measured on the single axial slice through the fovea of the femoral head.

Peripartal obstetric data such as mode of delivery, birthweight and head circumference were recorded for each patient. The patients were categorised into two groups: those who had vaginal deliveries and those who required caesarean sections. These two groups were compared in terms of their pelvimetric data and other parameters. The differences were assessed using the Student's *t*-test. The relationship of the pelvimetric measurements to some of the maternal characteristics was tested using the Pearson's coefficient of correlation and the significance of each coefficient value was assessed with the *t*-test. In each case, the level of significance was set at $P < 0.05$.

## Results

The clinical characteristics and the pelvic measurements of the patients are shown in Table 1. Among the three types of pelvimetric measurements made, the interspinous diameter had the lowest mean value of 10.53 cm while the highest value, 11.57 cm, was recorded for the transverse diameter.

**Table 1:** Clinical characteristics of the patients

| Parameters | Min. | Max. | Mean | S.D |
|---|---|---|---|---|
| 1. Age (yrs) | 20 | 40 | 29.6 | 4.68 |
| 2. Maternal height (cm) | 148 | 169 | 158.5 | 5.41 |
| 3. Parity | 0 | 4 | 1.0 | 0.85 |
| 4. Gestational Age at Delivery (weeks) | 34 | 42 | 38.6 | 1.33 |
| 5. Birth weight (kg) | 2.0 | 3.85 | 3.1 | 0.44 |
| 6. Head Circum ference (cm) | 32 | 36.6 | 34.5 | 1.18 |
| 7. Fetal length (cm) | 49.0 | 52.0 | 50.1 | 1.1 |
| 8. AP Inlet Diameter (cm) | 9.06 | 12.5 | 11.02 | 0.83 |
| 9. Transverse Diameter (cm) | 9.67 | 14.08 | 11.57 | 0.98 |
| 10. Interspinous Diameter (cm) | 9.46 | 12.26 | 10.53 | 0.62 |

**Table 2:** Comparison of patients who had caesarean section with those who had vaginal delivery

| Parameters | Caesarean Section N = 17 Mean | S.D | Vaginal Delivery N = 14 Mean | S.D. | Difference |
|---|---|---|---|---|---|
| 1. Antero-posterior Inlet diameter (AP) (cm) | 11.34 | 0.84 | 11.04 | 0.82 | t=1.01; p>0.05 |
| 2. Transverse diameter (TD) (cm) | 11.52 | 1.20 | 11.63 | 0.65 | t=0.32; p>0.05 |
| 3. Interspinous diameter (IS) (cm) | 10.57 | 0.45 | 10.47 | 0.84 | t=0.43; p>0.05 |
| 4. Head circumference (HC) (cm) | 34.92 | 1.27 | 34.04 | 0.87 | t=2.20; p<0.05 |
| 5. Maternal Height (cm) | 156.4 | 5.06 | 16.11 | 4.79 | t=2.65; p<0.05 |
| 6. Birth Weight (kg) | 3.08 | 0.46 | 3.13 | 0.44 | t=0.30; p>0.05 |
| 7. HC/AP Ratio | 3.10 | 0.54 | 3.10 | 0.24 | t=0.20; p>0.05 |
| 8. HC/TD Ratio | 3.06 | 0.35 | 2.93 | 0.14 | t=1.31; p>0.05 |
| 9. HC/IS Ratio | 3.31 | 0.20 | 3.27 | 0.24 | t=0.49; p>0.05 |

The comparison of clinical parameters of patients who had caesarean section with those who had vaginal deliveries is shown in Table 2. Vaginal delivery was achieved in 14 patients while 17 patients had caesarean section. The indication for caesarean section were cephalopelvic disproportion (14 patients), cervical dystocia (1 patient) and antepartum haemorrhage (2 patients). The mean birthweights of patients with caesarean sections was slightly less than that of those who had vaginal deliveries, although the difference was not statistically significant. Similarly, the mean AP inlet and the interspinous diameters were marginally lower in the patients who eventually had vaginal deliveries than in those who had caesarean sections. On the other hand, the mean head circumference of babies born by caesarean section (34.92 cm) was higher than that of vaginally delivered neonates (34.04 cm), a difference that was statistiscally significant. Mothers who delivered vaginally were also found to have a significantly higher mean height (126.1 cm) than those who had caesarean sections (156.4 cm). The ratios of the head circumference to the various pelvic diameters were similar in both groups of patients.

Among the interesting correlations found was the one between maternal height and the gestational age at delivery ($r = 0.5$; $P < 0.05$) and another one between maternal height and the transverse diameter of the pelvic inlet ($r = 0.27$, $t = 1.54$ not statistically significant). The duration of labour showed no correlation with any of the CT measurements.

## Discussion

The mean maternal age and height in this group of patients, as well as the anthropometric characteristics of their neonates, are quite similar to what had previously been reported from this environment [4,5]. One finding that was unexpected was the higher mean birthweight of babies delivered vaginally in comparison to those delivered by caesarean section. While the difference was not statistically significant, it is still remarkable because it is a departure from the findings in a previous study [4]. Moreover, it does not conform to the normal expectation that heavier babies will be associated with a higher incidence of feto-pelvic disproportion and a consequent increase in the caesarean section rate. This observation, when taken with the finding that the head circumference of babies delivered by caesarean section is higher, suggests that the specific anthropometric characteristics (other than the birthweights) of the fetuses may have an influence on the probability of achieving vaginal birth.

As expected, the interspinous diameter was the smallest of the three pelvic dimensions measured and, interestingly, more so in those who had vaginal deliveries. Notably, the inlet AP and transverse diameters in both categories of patients were higher than the levels previously established as indicating a contracted pelvis [4,5] and no significant differences were found between the groups. Yet, more than 80% of the caesarean sections were done for cephalopelvic disproportion, indicating that forces other than absolute pelvic measurements determine labour outcome. The two main parameters found to differ significantly between the two groups were the maternal height and the head circumference, neither of which required pelvimetry to determine. Even the ratios of the head circumference to the various pelvic diameters did not show any pattern of correlation with the outcome of labour. The correlation found between maternal height and gestational age at delivery conforms to previous findings in other studies [6,7].

The findings from this study suggest that antenatal CT-pelvimetry is not useful in predicting the outcome of labour as the pelvic dimensions in those who delivered vaginally did not differ significantly from measurements in those who had caesarean deliveries. Fetal parameters, particularly the head circumference, appear to be better predictors of the mode of delivery than absolute pelvic measurements. The quality and intensity of uterine contractile activity presumably plays a major role too. The relatively small size of the study population limits the extent to which the conclusions of this study can be generalised and points to a need for further evaluating the usefulness of this technique among pregnant women in this environment.

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