Original Research Article

X-ray pelvimetry: prognosis of delivery by cephalous-pelvic confrontation in Cotonou

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ABSTRACT

Background: The mechanical dystocia constitutes one of the causes of maternal death during labour. Reducing the incidence of complications of dystocia means recognize the factors induce dystocia. That justifies X-ray pelvimetry and cephalic fetal ultrasonography to predict the outcome of labour. This survey aims at establishing the prognosis of labour by a cephalous-pelvic confrontation.
Methods: This study was realised at CUGO and HOMEL, reference maternity hospitals in Cotonou from 28th March to 4th August 2006. That was a prospective study. During prenatal visit, pregnant women who had pelvis abnormality were recruited after their consent after counselling about exploration of their pelvis and fetal cephalic diameters. Pregnant women in their ninth month underwent to X-ray pelvimetry and fetal biometric ultrasonography.
Results: During that study, 122 pregnant women in their ninth month were recruited. Favourable prognosis (36.89%): natural delivery 31.15%; (concordance rate is 84.44%). Uncertain prognosis (18.85%): caesarean section (10.66%), natural delivery (7.37%). Unfavourable prognosis (44.26%): 40.16% deliveries by caesarean section. Concordance rate is 90.74%.
Conclusions: The cephalous-pelvic confrontation is a reliable prognosis method. It is recommendable in our maternity hospitals to prevent complications of dystocia, a cause of maternal death.

Keywords: Cephalous-pelvic confrontation, Dystocia, X-ray pelvimetry

INTRODUCTION

No more dying during labour is a legitimate goal that the obstetricians aim at and tackle every day to make it happen. Among the causes of maternal death include dystocia, one of the involved factors in their occurrence being the pelvis.[1]

During the labour, the fetus, to cross the mother's pelvis, confronts the diameters of its presentation with the diameters of the mother.[2,3] The outcome of this confrontation may be unfavorable, thus making it impossible to deliver by a low tract. The delay or absence of a relevant intervention to alleviate this situation may lead to uterine rupture. This fearful complication of mechanical dystocia often occurs, either in conditions of ignorance of the actual dimensions of the pelvis or is due to poor obstetrical practices.

Nowadays, X-ray pelvimetry and ultrasound exam have been made available in national reference hospitals. These explorations consider the diameter of the pelvis

and the fetal head; they contribute to the prognosis and the choice of the delivery tract.[4-6] This study aims at setting up the profile, the different types of pelvis of the pregnant women and the prognosis of the delivery by the cephalous-pelvic confrontation.

METHODS

The present study was conducted at the Medical Imaging Department of the National University Hospital Center "Hubert Koutoukou Maga" (NUHC-HKM) with collaboration of the University Clinic of Gynecology and Obstetrics (UCGO) of NUHC-HKM and Prenatal service of Lagune Maternity Hospital for the Mother and Child (HOMEL) in Cotonou.

To perform the X-ray pelvimetry, we used an X-ray machine equipped with a powerful generator in good condition allowing the use of high voltage; Two cassettes of 36cm x 43cm equipped with fast screens; X-ray films of 36cm x 43cm dimension with a high sensitivity; An automatic X-ray film processor; THOMS material (a Bakelite plate adjustable in height leaded centimeter and comprising a frame, a sliding pointer provided with a graduated vertical ruler in centimeter for the height measurement of table top-edge of the pubis, Bakelite Vertical ruler leaded mounted on a bracket graduated in centimeters). The photographs were made by medical imaging engineers trained in that technique. Our sample consists of 122 pregnant women in their ninth month, with an X-ray pelvimetry indication.

The present study was a prospective cross-sectional study of women in their ninth month of pregnancy. It took place from March 28th to August 4th, 2006. It focused on women attending one of the last prenatal consultations either at the CUGO of CNHU-HKM, or at prenatal service of HOMEL and having an X-ray pelvimetry indication after clinical examination by a Gynecologist-Obstetrician doctor. The inclusion criteria selected for our sample were: pregnant women at their ninth month, with an X-ray pelvimetry indication and addressed to the CNHU radiology department. Excluded were pregnant women that were not in their ninth month, who did not have a fetal ultrasound exam at their ninth month, the twin pregnancy and breech presentation cases.

Each pregnant woman benefited from a profile and face picture of the pelvis according to Thoms's technique.[7] Following the performance of these pictures, we measured the diameters of the main brim: the median transverse (Tmed), the promonto-retropubic (PRP), the maximum transverse (Tmax).

The performed measurements made it possible to classify the pelvis into morphological types according to Thoms's criteria and anatomical types according to Magnin's criteria.[7,8] In the morphological classification according to Thoms, there are: the Dolichopellic pelvis with a GWP>T max, the Mesatipellic pelvis with a GWP = T

Max or <T max of 1cm, the Brachypellic pelvis with a GWP <T max of 1 to 3 cm, the Platypellic pelvis with a PRP <T max of more than 3cm. In the anatomical classification, according to Magnin, the pelvis is pure flattened (BAP) when the PRP <10.5 cm and the T med = 12.5 cm; It is transversally narrow (BTR) if the PRP = 10.5 cm and the T med <12.5cm; Flattened and Generally narrow (BAGR) in case of a predominant decrease in PRP; Transversally and generally constricted (BTGR) in case of a predominant decrease in Tmed; Generally narrow (BGR) if decrease of two diameters.

The Magnin index is the sum of the median transverse (Tmed) and the promonto-retropubian (PRP).[8] The prognosis of the labour is said to be very favorable when the Magnin index is equal to or greater than 23; Favorable when it is between 22 and 23; Reserved between 21 and 22; uncertain between 20 and 21 and poor for a value less than 20. In practice Magnin index confronts the fetal biparietal diameter allows the use of Magnin's diagram (Figure 1), to determine the delivery tract.[3,8]
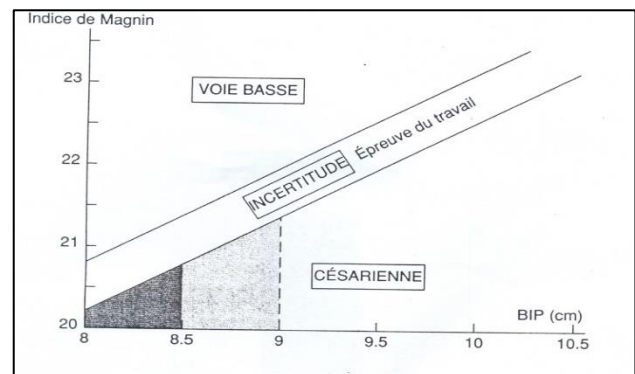
Figure 1: Magnin's cephalous-pelvic confrontation diagram.

After taking the pictures and the measurement of pelvic diameters, the confrontation with the data of fetal ultrasound exam at the ninth month, based on Magnin's diagram was used to study the prognosis of the labour. The results were recorded on the data collection form and on the examination slip. These slips were returned to the services where the pregnant women were being followed.

The variables studied were: age, height, and pregnant women gender, morphological and anatomical type of the pelvis, the prognosis of the labour and the delivery mode performed.

The data collection technique was based on an interview with the pregnant woman for filling in the predetermined survey form. For ethical reasons, we explained to pregnant women to have their consent, the interests of X-ray pelvimetry for the foresight of the delivery mode and the effects of X-rays on the fetus during the ninth month of pregnancy. Data processing was done with the software Epi Info 6.04, French version.

RESULTS

The present results focused on the socio-anthropometric characteristics of pregnant women, the distribution of pelvis according to anatomical and morphological classifications, ultrasound measurements of biparietal diameter of the fetal head, cephalous-pelvic confrontation, prognosis of delivery, prognosis rate of concordance with the delivery mode finally realized.

Socio-anthropometric characteristics of pregnant women

The average age of pregnant women was 25 years (range 16-39 years). The majority were between 20 and 29 years old, either 69.67 pc. The average size of pregnant women was 156 cm (range 134-174 cm). The majority were between 1.50 m and 1.69 m, either 102/122 (83.61 pc).

The majority of the pregnant women were nulliparous and primiparous, either 106/122 (86.88 pc). The multiparous were only 3 (2.46 pc) Classification of pelvis (Table 1).

Table 1: Distribution of pelvis according to Magnin's anatomical classification.

Type of pelvis	No.	Frequency	Cumulative frequency
BTR	59	48.36	48.36
BGR	26	21.31	69.67
BAGR	32	26.32	95.90
BTGR	01	0.82	96.72
Normal	04	03.28	100.00
Total	122	100	

Distribution morphological classification according to Thoms's pelvis

The pelvis of the brachypellic type was the most frequent with 56 pregnant women out of 122 (45,90 pc). The platypellic type was the least common with 2/122 (1.64 pc) (Table 2).

Table 2: Distribution of pregnant women according to size and Magnin Index. Distribution of fetal biparietal diameters.

	≤ 20	20-21	21-22	22-23	≥ 23
130-139 cm	02	00	00	00	00
140-149 cm	05	06	05	00	00
150-159 cm	05	19	17	14	05
160-169 cm	02	02	14	15	09
170-179 cm	00	00	00	00	02
Total	14	27	36	29	16

The mean value for biparietal diameter studied was 88.39 mm. The smallest value for BIP was 80 mm and the largest value was 99.1 mm. The majority 54/122 (44.26) were between 85 and 89 mm (Table 3).

Table 3: Frequency of prognosis according to cephalous-pelvic confrontation.

Prognosis	Number	Frequency (pc)	Cumulative Frequency (pc)
Favorable	45	36.89	36.89
Uncertain	23	18.85	55.74
Reserved	54	44.26	100.00
Total	122	100.00	-

Out of 23 pregnant women with uncertain prognosis, 5 had a normal delivery and 13 went for a caesarean section for dynamic and mechanical dystocia indications.

Calculation of labour prognosis test characteristics.

- Mobilized (Mo) = A / (A + C) = 49/56 = 0.8750 = 87.50%
- Specificity (Sp) = D / (D + B) = 38/43 = 0.8837 = 88.37%
- Positive predictive value (VPP) = A / (A + B) = 49/54 = 0.9074 = 90.74%
- Negative predictive value (VPN) = D / (D + C) = 38/45 = 0.8444 = 84.44% (Table 4).

Table 4: Concordance rate between prognosis and delivery mode finally realized.

	Caesarean section	Normal delivery	Total
Reserved prognosis	49 (40.16%) (A)	05 (B)	54 (A+B)
Favorable prognosis	07 (C)	38 (31.15%) (D)	45 (C+D)
Total	56 (A+C)	43 (B+D)	99 (A+B+C+D)

DISCUSSION

Socio-anthropometric characteristics of pregnant women

Our sample consisted of 122 Black pregnant women. The average age of pregnant women was 25 years. The youngest was 16 years old and the oldest was 39 years old. The majority were between 20 and 29 years, either 69.67 per cent.

Sample of present study was relatively young as the one worked on by Cissé and collaborators.[9] The majority of them had a size between 1.50m and 1.69m, either 83.61per cent.

The majority of our pregnant women were nulliparous and primiparous, either 86.88 per cent.

Anatomical types of pelvis

The present series consists of 96.72 per cent of shrunken pelvis with 48.36 per cent of transversely narrowed pelvis (Table 1). This high percentage of BTR is characteristic of African women pelvis as shown by Matulewicz and also reported by Merger and Collaborators but remains much higher than that of the French women.[5,10]

Morphological distribution of pregnant women according to Thoms's classification

The morphological distribution of the different types of pelvis shows that the pelvis of brachypellic type is the most frequent in our sample either 45.90 per cent. This frequency of the brachypellic type is close to that of the French women which is 50 per cent, Bantu women from Congo which is 49.13 per cent; but largely deviates from those of the Democratic Republic of Congo (DRC) (ex Zaireans), which is 35 per cent, blacks and whites from the United States who are respectively 25 per cent and 32 per cent.[5,7,10,11]

Distribution of pregnant women according to the size and Magnin index

We noticed in this study that for pregnant women who have a size less than 1.50m, the Magnin index is less than 22 (Table 2); the prognosis of low delivery is uncertain. This observation was also made by Mahmood and Collaborators who also reported a significant increase of caesarean section rate in women of small size.[12]

Frequency of prognosis according to cephalous-pelvic confrontation.

The majority of the biparietal diameters studied (44.26 per cent) are between 85 mm and 89 mm. The study of the prognosis of our delivery sample revealed 45 favorable prognosis (either 36.89 per cent), 23 uncertain prognosis (either 18.85 per cent) and 54 reserved prognosis (either 44.26 per cent) (Table 3). These rates are different from those reported by Schaal and collaborators which are 60 per cent in the favorable prognosis area, 24 per cent in the uncertain zone and 16 per cent in the reserved prognosis zone.[13] This difference may be justified by the nature of our sample, which is composed only of women presenting a clinical indication for X-ray pelvimetry.

Concordance between the prognosis and the realized delivery mode

Out of the 45 favorable delivery prognosis (either 36.89 per cent), 38 pregnant women had a normal labour by low tract, a concordance rate of 84.44%, linked here to the negative predictive value (NPV = 0.84). For the uncertain prognosis, of the 23 uncertain prognosis (18.85 per cent), 5 pregnant women had a normal labour and 13 went for a caesarean section for dynamic and mechanical dystocia indications. The choice of delivery mode in these cases has been highly labour-oriented.

For the 54 (either 44.26 per cent) reserved prognosis, 49 (either 40.16 per cent) of pregnant women actually went for a caesarean section for reasons largely related either to the maternal pelvis (BGR and BTR) alone or to the maternal pelvis and to the fetal head (feto-pelvic disproportion), either a concordance rate of 90.74%, linked here to the positive predictive value (PPV = $0.9074 \approx 0.91$). The sensitivity of the prognosis test is about 87%, and the specificity is 88%.

The confidence level given to the diagram in this reserved prognosis area in our series is therefore 90.74 per cent. This close rate is that indicated by Magnin and Collaborators which is 9 out of 10.[4] Note that there was a high rate of caesarean section in our series (69 cases out of 122, either 56.55 per cent). This could be explained by the large number of shrunken pelvis in our sample (96.72 per cent) (Table 3). It is this high caesarean section rate that Langer and Schlaeder have tried to explain in these terms: The two main indications that may explain the rise in caesarean section are cicatricial uterus and dystocia.[14]

CONCLUSION

The fight against maternal morbidity and mortality associated with dystocia requires adequate material and human resources, such as x-ray pelvimetry, ultrasound machines and trained technicians in their use at affordable cost in reference hospitals. The use of Magnin's cephalous-pelvic confrontation diagram remains a benchmark in this fight, even though it does not address all the stages of the pelvis likely to be involved in dystocia. However, it proves to be a method of prognosis for reliable labour within limits, and recommended in our maternity wards, if necessary, to prevent complications related to dystocia, causes of maternal deaths.

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