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X-Ray pelvimetry-reappraisal

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Summary: Antenatal erect lateral X-ray pelvimetry was performed for 116 primigravidas and 53 multigravidas because of suspected cephalopelvic disproportion (CPD). Multigravidas were further subgrouped into 4 gravidas and >4 gravidas. In the primigravidas, there was no statistical difference in the mean value of the anteroposterior diameter of the pelvic inlet (APD) of the elective (10.4 cm, ±0.6 SD) and the emergency (10.5 cm, ±0.9 SD) caeseran section group. In the multigravidas, the mean value of the APD showed a statistically significant decrease with increased parity. In this group, the chances of delivery by caesarean section were 74%, when the APD was less than 10.5 cm, and 12% if the APD was grater than 11.5 cm. It is concluded that cephalopelvic disproportion in primigravidas should only be diagnosed after adequate trial of labour with adequate uterine contractions. In multiparous patients, especially grand multiparas, X-ray pelvimetry is recommended in cases of suspected CPD before a trial of vaginal delivery is conducted, since the mode of delivery seems to depend primarily on the pelvic capacity.

Key words: primigravida; multigravida; X-ray pelvimetry; cephalopelvic disproportion; anteroposterior diameter of the pelvic inlet.

INTRODUCTION

Modern obstetrical trends require the support of objective data and the evaluation of risks and benefits of every management policy. In the late 1970s, the value of X-ray pelvimetry in identifying foetal pelvic disproportion fell into disfavour. Firstly, worries regarding the effects of irradiation on the foetus have always been a controversial subject ([1, 2]). Secondly, some studies have shown that there is no significant difference in pelvic dimensions between patients who had antepartum pelvimetry for suspected pelvic contraction and patients randomly chosen ([3, 4]). Finally, with a policy of active management of labour, mild degrees of cephalopelvic disproportion (CPD) are often overcome by expert utilization of oxytocin administration ([5]).

Undoubtedly, however, the practice of obstetrics in a given population should be tailored according to existing risk factors. An example of this are communities with a high proportion of multigravidas, such as in most developing countries. In this group of patients – multigravidas, especially grand multiparas – the diagnosis of obstructed labour is easily overlooked with the likely disasterous consequences of uterine rupture and high perinatal mortality ([5, 6, 7, 8]). Therefore, in multiparous patients with suspected cephalopelvic disproportion, careful consideration of the various elements involved in the process of labour, including the capacity of the pelvis, is essential. The value of radiological assessment of the pelvis has not been directly addressed in relation to parity. This aspect could be important for certain obstetric populations. It is, ho-

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wever, necessary for each obstetric unit to examine the place of X-ray pelvimetry in the management of its own patients. This study is undertaken in an attempt to fulfil this aim.

PATIENTS AND METHODS

The obstetric records of 279 patients who had X-ray pelvimetry performed during pregnancy or labour at King Abdulaziz University Hospital, Jeddah, Saudi Arabia, over a period of two consecutive years were examined. Only data from patients who had pelvimetry because of clinically suspected cephalopelvic disproportion (CPD) were analyzed. The technique used in this unit is a standing lateral film of the pelvis. In addition to the morphological features of the pelvis, the antero-posterior diameter (APD) of the inlet was measured from the inner edge of the pubic symphysis to the sacral promontory. All X-rays are read and reported by an experienced radiologist.

Primigravidas (116 patients) and multigravidas (53 patients) were examined separately. Since it is recognised that the risk to both mother and child increased parity after the third pregnancy (9), the multigravidas in this study were further subgrouped into 4 gravidas and >4 gravidas, the minimum being 5 and maximum 12 gravidas. In each group, the mode of delivery, whether abdominal or vaginal, was noted as well as the mean birth veight and the mean pelvic inlet APD. Decisions for CS deliveries were usually made by a consultant.

The Student T and χ^2 tests were used for statistical analysis.

RESULTS

The indications for X-ray pelvimetry in the 279 cases are displayed in Figure 1.

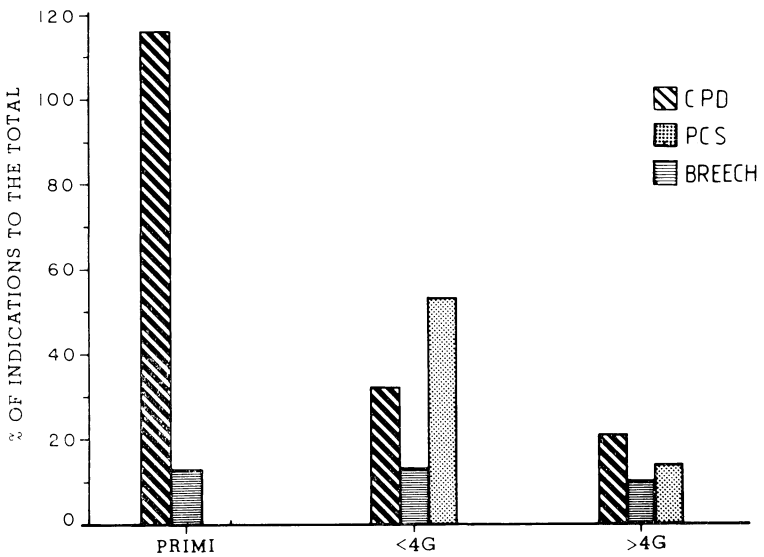

Fig. 1. — The main indications for pelvimetry in the three groups.

In both primigravidas (PGs) and multigravidas (MGs), the main indication was suspected CPD (60%). Other indications were previous caesarean section (CS) (24.4%), breech presentation (12.5%). In 5.0%, the indication for pelvimetry was not specified.

Table 1 shows the numbers, the mode of delivery, the mean APD and the mean birth weight in PGs and MGs with suspected CPD. In both groups, the mean birth weight did not show any significant difference, whether the delivery was by

Table 1. – *Mode of Delivery, APD (in cm), Birth Weight (in g) in Primigravidas and Multigravidas.*

	Primigravidas			Multigravidas		
	Pts. N = 116	APD (±SD)	B. Wt. (±SD)	Pts. N = 53	APD (±SD)	B. Wt. (±SD)
Vaginal:	9	11.2 (±1.0)	3263 (±459)	34	11.5 (±0.9)	3212 (±812)
Caesarean:	25	10.5* (±0.9)	3131 (±544)	19	9.8* (±1.2)	3489 (±467)

* statistically significant

CS or vaginally, whereas the mean APD of the pelvis was significantly smaller in the CS group in both PGs and MGs ($P<0.001$).

When PGs were analysed (Table 2), there was no significant difference in the APD or the foetal birth weight in patients who had a primary elective CS and patients who were allowed a trial of labour that ended by an emergency CS. In this study, all multigravidas were allowed a trial vaginal delivery, there were no elective caesarean section deliveries.

Table 2. – *The mean APD and mean Birth Weight (± SD) in Primigravidas delivered by emergency and by elective caesarean section.*

	APD (cm)	Birth Weight (gms)
Emergency CS (N = 16)	10.5 (±0.9)	3151 (±513.3)
Elective CS (N = 9)	10.4 (±0.6)	3122 (±606.1)

Using the X^2 test to correlate between the mode of delivery and the APD, there was a significant correlation between increased incidence of CS deliveries with decreased APD in multigravida patients, but no such correlation was found in primigravidas (Table 3).

Table 3. – *Mode of Delivery in Primigravidas and Multigravidas in Relation to APD.*

APD in cm	Primigravidas		Multigravidas	
	Vaginal	CS	Vaginal	CS
≤ 9	1	0	0	4
> 9 - ≤10	10	8	2	9
>10 - ≤10.5	16	5	3	1
>10.5 - ≤11	15	3	7	3
>11 - ≤11.5	16	4	6	0
>11.5	33	5	16	2

The relationship between the APD, birth weight and mode of delivery in multigravidas is graphically displayed in Figure 2. Patients delivered by CS are concentrated to the left side of the diagram, and lines have been drawn which empirically define zones where 74%, 20% and 12% of MGs were delivered by CS. In primigravidas, a similar relationship between APD, birth weight and mode of delivery is plotted in Figure 3, excluding cases of elective CS. Here, no similar zones could be defined, since the incidence of CS did not show a consistent correlation with the APD measurements.

Fig. 4 displays the relation between parity versus birth weight showing an increase in birth weight with increased parity; however this did not reach a statistical significance. On the other hand, Fig. 5 displays the relationship between parity versus APD. Here, the mean pelvic inlet APO was significantly larger in PGs compared to the >4 gravidas ($P<0.001$).

When multigravidas were further subgrouped into 4 gravidas and >4 gravidas, the incidence of CS was 46% and 63% respectively, showing an increased rate of CS with increased parity.

DISCUSSION

Many studies have shown that X-ray pelvimetry has a limited place in the ma-

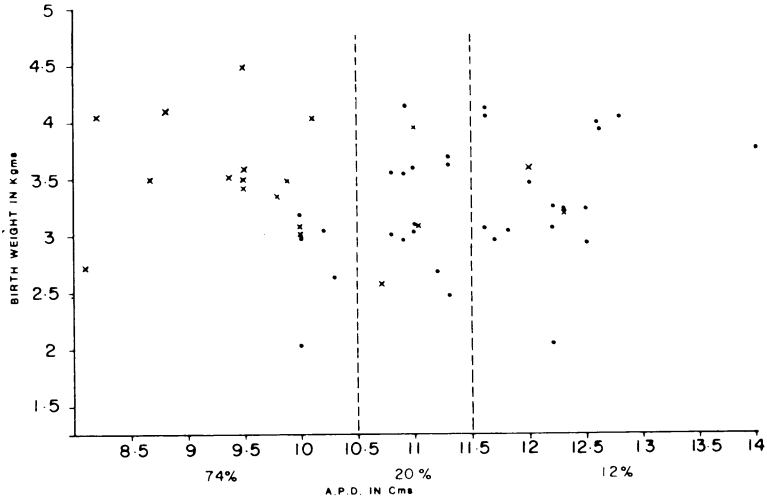

Fig. 2. — Relationship between A.P.D., birth weight and mode of delivery in multigravidas. Lines have been drawn at 10.5 and 11.5 cm (· = vaginal delivery, x = C.S.). 74%, 20% and 12% are the percentages of C.S. delivery. (Note that there was no significant change in the birth weight).

nagement of pregnancy and/or labour, if the foetus is in the cephalic presentation ([4, 10, 11]). Most of the factors which operate during vaginal birth cannot be predicted before labour ([12]), even pelvic dimensions may somewhat increase during labour, due to the moulding of the pelvis ([13, 14]).

In this study, only patients who had X-ray pelvimetry because of clinically suspected CPD were examined. The diagnosis was clinically suspected in 116 pri-

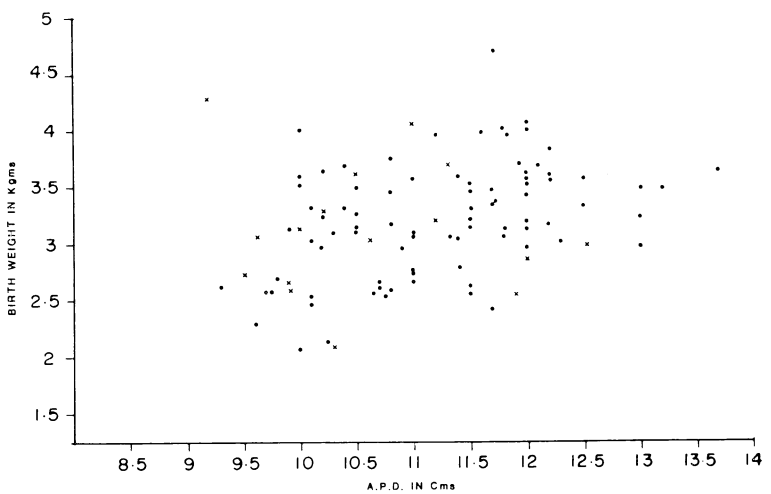

Fig. 3. — The relationship between A.P.D., birth weight and mode of delivery in primigravidas (· = vaginal delivery, x = C.S.). There is no correlation between mode of delivery and pelvic A.P.D.

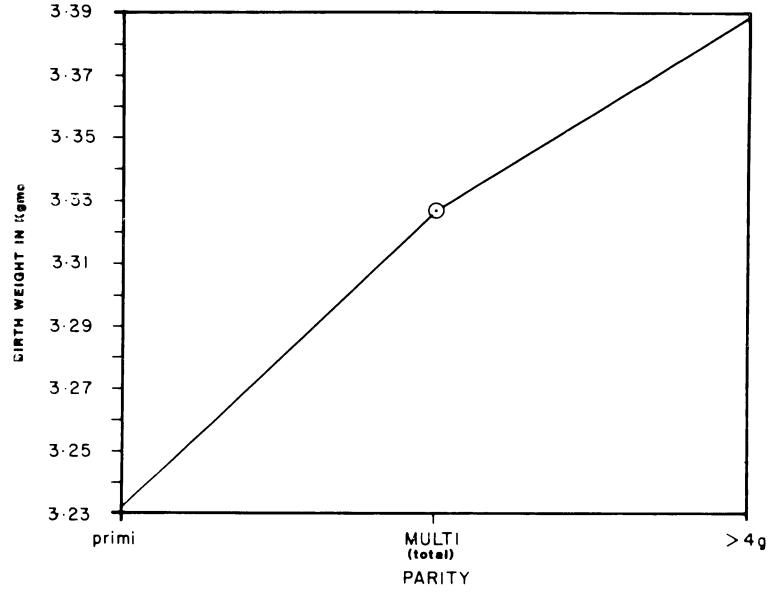

Fig. 4. — The relationship between parity and mean foetal birth weight. No statistical significance between parity and mean birth weight.

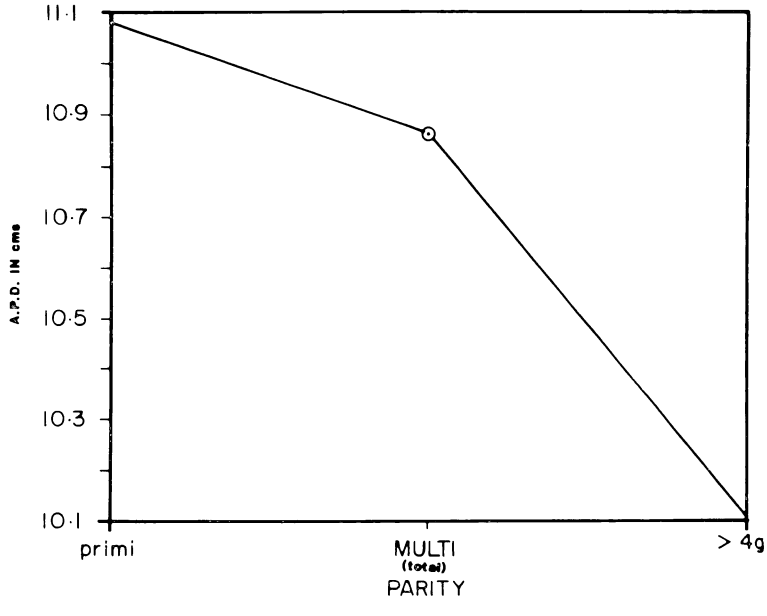

Fig. 5. — The relationship between parity and mean A.P.D. Statistically significant difference between the A.P.D. of primigravidas and > 4 gravidas.

migravidas. Following X-ray pelvimetry, 9 patients were delivered by elective CS because of alleged cephalopelvic disproportion, while 106 patients were given a trial of labour. Out of those, 92 patients were delivered vaginally and 15 patients were delivered by emergency CS. The fact that both the mean birth weight and the mean pelvic inlet APD of patients delivered by emergency CS, after having been given a trial of labour, was not significantly different from that of patients delivered by elective operation (Table 3), substantiating other investigators' views that the diagnosis of CPO in primigravidas should only be reached after full trial of labour with adequately stimulated uterine actions ([10, 15]). It is also theoretically possible that the experience of labour, i.e. uterine contractions, cervical dilatation and effacement, stretching of vaginal and perineal tissue, even if it ends by CS, is likely to increase the chances of successful vaginal delivery in a subsequent trial of labour; however prospective controlled studies are required to substantiate this impression.

Multiparous patients are obstetrically considered to be a different biological species. Clinical experience has shown that, contrary to the primigravid uterus which is immune to rupture even in the presence of cephalopelvic disproportion, the multigravid uterus can rupture even under normal circumstances ([5]). Therefore, in multigravidas, the concept of trial of labour for suspected CPD is different from that in primigravidas in as far as the selection of patients for the trial and the conduct of the trial itself. If a trial of vaginal delivery is to be attempted in a multiparous patient because of suspected CPD, as much information as possible regarding the various parameters operating in labour should be assessed, particularly the estimated foetal weight and the capacity of the pelvis. Moreover, the use of oxytocin to enhance stronger uterine contractions in order to overcome a suspected degree of disproportion is relatively contraindicated and only used on a strictly individual basis ([5, 16]).

In this study, the mode of delivery in multigravidas displayed a direct correlation with the pelvic inlet diameter APD (Table 4). In this group, patients with pelvic inlet (APD) of less than 105 cm had a significantly higher chance of delivery by CS than patients with APD of more than 11.5 cm (74% and 11.8% respectively) ($P < 0.001$). While patients with an APD between 10.5 cm and 11.5 cm had a 20% chance of a delivery by CS (fig. 2). No similar correlation between the mode of delivery and the APD could be demonstrated in cases of PGs, where the incidence of CS was 26% of deliveries with APD of less than 10.5 cm and 10% with APD of more than 11.5 cm. It is thus concluded that radiological pelvimetry in clinically suspected CPD has a value in predicting the mode of delivery in case of multiparous patients, but not in primigravidas.

Finally, there have been several definitions of the term « grand multipara » ([7, 17, 18]). However, the tendency is now to apply the term to women who have had five or more previous viable babies ([9]).

In this study, it is of clinical significance that grandmultiparous patients (>4 gravidas), who have had successful vaginal deliveries in the past displayed the smallest mean pelvic inlet diameters (Fig. 5). This fact could explain the increased incidence of CS in this group (63%), since there was no significant increase in the mean birth weight with increased parity (Fig. 4). Structural alterations in the shape and/or the diameters of the pelvis are known to develop as a complication of Osteomalacia. This condition is likely to occur as sequelae of the combined effect of repeated pregnancies and lactation with short intervals in between, especially if complicated by undernutrition ([19]).

In conclusion, there is a very limited place for antenatal X-ray pelvimetry in the management of suspected cephalopelvic disproportion in primigravidas with the foetus in the cephalic presentation. In primigravidas, this diagnosis should only be made retrospectively after a full and adequate trial of labour. If such a policy is adopted, the potential hazards of irradiations are avoided and the saving in terms of cost and time could be significant. There is, however, another obstetrically dangerous group of the population which is not commonly seen in developed countries, that is the grandmultiparous patients ([20]), who are suspected of having CPD. In this high risk group, full knowledge of labour parameters including radiological pelvis assessment should be known before a trial of vaginal delivery is attempted.

REFERENCES

1) Russel I. G. B.: "Radiation Hazards, Radiology in obstetrics and antenatal paediatrics". 1st edition, pp. 16-35. Edited by Butterworth & Co., London 1973.
2) Lione A.: Ionizing radiation and human reproduction". *Reproductive Toxicity, 1,* 3, 1987.
3) Russel J. G. B., Richards B.: "A review of pelvimetry diameter". *Br. J. Radiol., 44,* 780, 1971.
4) Laubei D. W., Varner M. W., Graikshank D. P.: "Aprospective evaluation of X-ray pelvimetry". *J. American Medical Association, 246,* 2187, 1981.
5) O'Driscol K., Meagher D.: "Active management of labour". 1st edition, p. 9, W. B. Saunders, London, Philadelphia, Toronto, 1980.
6) Feeney J. K.: "The problems of high parity". In: "Contemporary Obstetrics and Gynaecology", edited by Chamberlain G., Section I, pp. B2-139. London, Northwood Publications, 1977.
7) Fuchs K., Peretz B. A., Macrovici R., Paldi E., Timor-Trish I.: "The grand-multipara. Is it a problem? A review of 5787 cases". *International Journal of Gynaecology and Obstetrics, 283,* 321, 1977.
8) Mesleh R.: "The grandmultipara still an obstetric problem". *J. of. Obst. Gyn., 7,* 84, 1986.
9) Lawson J.B.: "Antenatal care". In: Obstetrics and Gynaecology in the Tropics and Developing Countries". Edited by Lawson J. B. and Stewart D. B., Chapter I, pp. 4-5, London, Edward Arnold, 1981.
10) Jagani N., Schulman H., Chandra P., Gonzalez R., Fleischer A.: "The predictability of labour outcome from a comparison of birth weight and X-ray pelvimetry". *Am. J. Obst. Gyn., 139,* 507, 1981.
11) Joyce D. N., Giwa-Osagie F., Stevenson G. W.: "Role of pelvimetry in active management of labour". *Br. Med. J., 4,* 505, 1975.
12) Lundh C., Lindmark G., Wilbrand H.: "Reliability of radiographic pelvimetry. A methodological study". *Acta Obst. Gyn. Scand., 65,* 411, 1986.
13) Borell U., Fernstrom I.: "The movement at the sacroiliac joints and their importance to changes in the pelvic dimensions during parturition". *Acta Obst. Gyn. Scand., 36,* 42, 1957.
14) Ohlsen M.: "Moulding of the pelvis during labour". *Acta Radio (Diag.), 14,* 417, 1957.
15) Klapholz H.: "Evaluation of fetopelvic relationship, Management of labour". Edited by: Cohen W. R., Friedman E. A., Baltimer University Park Press, 1983.
16) Gibb D. M. F., Cardozo L. D., Studd J. W. W., Mago S. A. L., Cooper D. J.: "Outcome of spontaneous labour in multigravidas". *Br. J. Obst. Gyn., 89,* 708, 1982.
17) Eastman N. J.: "The hazards of pregnancy and labor in the grand multipara". *New York State Journal of Medicine, 40,* 1708, 1940.
18) Schram E. L. R.: "The problem of the grand multipara". *American Journal of Obstetrics and Gynecology, 67,* 253, 1945.
19) Mekherjee C. S.: "Osteomalacia in: Obstetrics and gynaecology in tropical and developing countries", p. 29, edited by Lawson J. B., Steward D. N., London, Edward Arnold, 1977.
20) Mesleh R.: "Stillbirths and first week deahts in Saudi Arabia - causes and prevention". *J. Obst. Gyn., 6,* 173, 1986.

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