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Investigation of occiput posterior delivery by intrapartum sonography

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KEYWORDS: Cesarean section; fetal position; labor; ultrasound

ABSTRACT

Objective *To investigate if occiput posterior delivery is the consequence of persistence of an initial occiput posterior position or malrotation from an initial occiput anterior or transverse position.*

Methods *This was a cross-sectional study involving transabdominal sonography to determine fetal occipital position in 918 singleton pregnancies with cephalic presentation in active labor at 37–42 weeks of gestation. The relationship between occipital position in labor and at delivery was examined.*

Results *The occiput was posterior in 33.0% (149/452), 33.9% (101/298) and 19.0% (32/168) of fetuses at the respective cervical dilatations of 3–5, 6–9 and 10 cm and this persisted at delivery in 21.5% (32/149), 31.7% (32/101) and 43.8% (14/32) of cases. In 70% (32/46), 91% (32/35) and 100% (14/14) of occiput posterior deliveries there was persistence from this position at 3–5, 6–9 and 10 cm of cervical dilation.*

Conclusions *The majority of occiput posterior positions during labor rotate to the anterior position even at 10 cm of cervical dilatation. However, the vast majority of occiput posterior positions at delivery are a consequence of persistence of this position during labor rather than malrotation from an initial occiput anterior or transverse position. Copyright © 2004 ISUOG. Published by John Wiley & Sons, Ltd.*

INTRODUCTION

Occiput posterior position, found in about 5% of deliveries, is associated with increased rates of Cesarean section, perinatal morbidity and severe maternal perineal lacerations and anal sphincter injury[1–4]. A radiological study in the early 1930s reported that at the onset of labor the fetal occipital position was posterior in about 20% of fetuses[5]. In *Williams Obstetrics* it is reported that in about 90% of occiput posterior positions there is subsequent rotation to the anterior position[6]. Therefore, the majority of occiput posterior deliveries are thought to be a consequence of malrotation from an initial occiput anterior or transverse position, rather than persistence of an initial occiput posterior position. Although the aforementioned book is widely cited in the literature in support of this concept of malrotation we could not find any supportive evidence. Furthermore, recent intrapartum sonographic studies have demonstrated that clinical assessment of the fetal occiput is inaccurate both in the first and second stage of labor and more so when the occiput is posterior[7–11].

Two sonographic studies investigating whether occiput posterior position at delivery is the consequence of malrotation from an initial occiput anterior or transverse position or persistence of an initial occiput posterior position have reported conflicting results. Gardberg *et al.* examined 408 patients and reported that 62% (13/21) of occiput posterior deliveries resulted from malrotation[12]. By contrast, Souka *et al.* examined 106 patients and reported that 75% (3/4) of occiput posterior deliveries were the consequence of failure of rotation from an initial posterior position[11]. One obvious difference between the studies is that Souka *et al.*[11] examined women during the first and second stage of active labor, whereas Gardberg *et al.*[12] examined women either before the onset of labor (43%) or in early spontaneous labor. Another possible explanation for the apparent controversy is that the number of occiput posterior deliveries was small and neither study demonstrated a significant difference in the

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percentage of occiput posterior deliveries resulting from malrotation or failure of rotation from this position during labor.

In this cross-sectional study of 918 pregnancies we investigated further the issue of whether occiput posterior deliveries are primarily the consequence of malrotation or not. This issue has potentially important implications for the management of labor. There is evidence that the incidence of occiput posterior position at delivery is substantially reduced by active management of labor[4]. Furthermore, a recent randomized study in nulliparous women in active labor at term reported that active management, compared to expectant management, was associated with a significantly lower Cesarean section rate[13]. If the primary cause of occiput posterior delivery is failure of rotation it is possible that ultrasound examination in the first stage of labor and targeted active management for those women with this malpresentation could potentially reduce the incidence of occiput posterior position at delivery and its associated complications.

METHODS

This was a cross-sectional, prospective study conducted between February 2001 and April 2002 in the labor ward of a district general hospital in London, UK. Approval from the local ethics committee and written consent from all participants were obtained.

Transabdominal sonography to determine fetal occipital position was carried out in 918 singleton pregnancies with cephalic presentation in active labor (cervical dilatation of 3 cm or more) at 37–42 weeks of gestation. Maternal and labor characteristics, including maternal age, height, weight, ethnicity, gestational age, parity, whether labor was spontaneous or induced, use of oxytocin, epidural anesthesia, occipital position at delivery and birth weight, were obtained from the hospital records of the women.

In all women, immediately before or after the routine clinical examination during labor, the fetal occipital position was determined sonographically and recorded as anterior, transverse or posterior, by an appropriately trained sonographer[7,8]. The ultrasound transducer was

Table 1 Characteristics of the population and results of the univariate analysis on the associations with the incidence of occiput posterior position at delivery

Characteristic	n *(%) or median (range)*	*Odds ratio (95% CI)*	P
Age (years)	28 (16–43)	1.03 (0.99–1.07)	0.140
< 20	61 (6.7%)		
20–35	787 (85.7%)		
> 35	70 (7.6%)		
Ethnicity			0.024
Caucasian	512 (55.8%)	1	
Afro-Caribbean	127 (13.8%)	0.72 (0.37–1.37)	
Asian/Oriental	279 (30.4%)	0.47 (0.27–0.82)	
Body mass index	24.2 (15.5–48.6)	1.05 (1.01–1.09)	0.013
< 20	69 (7.5%)		
20–25	388 (42.3%)		
> 25	461 (50.2%)		
Parity			0.206
Nulliparous	497 (54.1%)	1	
Parous	421 (45.9%)	0.78 (0.53–1.14)	
Gestational age (weeks)	40 (37–42)	1.18 (0.98–1.41)	0.068
Labor onset			0.380
Spontaneous	635 (69.2%)	1	
Induction	283 (30.8%)	1.22 (0.78–1.91)	
Use of oxytocin			< 0.0001
No	513 (55.9%)	1	
Yes	405 (44.1%)	5.60 (3.35–9.35)	
Epidural anesthesia			< 0.0001
No	568 (61.9%)	1	
Yes	350 (38.1%)	2.46 (1.60–3.78)	
Cervical dilatation (cm)			0.500
3–5	452 (49.2%)	1	
6–9	298 (32.5%)	1.17 (0.74–1.87)	
10	168 (18.3%)	0.8 (0.43–1.50)	
Occipital position			< 0.0001
Anterior	355 (38.7%)	1	
Transverse	281 (30.6%)	2.36 (0.86–6.46)	
Posterior	282 (30.7%)	22.17 (9.51–51.73)	
Mode of delivery			< 0.0001
Vaginal	779 (84.9%)	1	
Cesarean	139 (15.1%)	20.59 (12.61–33.61)	
Birth weight (kg)	3.41 (1.94–4.93)	1.57 (1.02–2.41)	0.038

first placed transversely in the suprapubic region of the maternal abdomen. The landmarks depicting fetal occipital position were the fetal orbits for occiput posterior position, the midline cerebral echo for occiput transverse position and cerebellum or occiput for occiput anterior position. For the latter position the fetal spine was demonstrated in its sagittal plane and traced from the fetal thorax to the occiput. The findings were recorded in a datasheet depicting a circle, like a clock, with 24 divisions and the position was described as anterior if the occiput was between 0930 and 0230 h, transverse if between 0230 and 0330 h or 0830 h and 0930 h and posterior if between 0330 and 0830 h.

Statistical analysis

The χ^2-test was used to assess the significance of the differences in the percentages of occiput posterior position at delivery deriving from occiput anterior, transverse and posterior positions at different stages of labor. Logistic regression analysis was used to determine the significant independent predictors of occiput posterior position at delivery. In this analysis maternal age, body mass index (BMI), gestational age and birth weight were used as continuous numerical variables. A score was given for ethnicity (1 for Caucasian, 2 for Afro-Caribbean, 3 for Asian/Oriental), parity (0 for nulliparous, 1 for parous), labor onset (0 for spontaneous labor, 1 for induced or augmented labor), cervical dilatation (1 for dilatation of 3–5 cm, 2 for dilatation of 6–9 cm, 3 for full dilatation), fetal occipital position at the time of the scan (1 for occiput anterior, 2 for occiput lateral, 3 for occiput posterior), use of epidural anesthesia and oxytocin (0 for no, 1 for yes) and mode of delivery (0 for vaginal, 1 for Cesarean).

RESULTS

The median maternal age was 28 (range, 16–43) years and the median gestation at examination was 40 + 1 (range, 37 + 0 to 42 + 2) weeks. The characteristics of the population examined and the results of the univariate analysis on the associations with the incidence of occiput posterior position at delivery are shown in Table 1. There were significant associations with ethnic origin, BMI, use of oxytocin, epidural anesthesia, occipital position during labor, mode of delivery and birth weight. Multivariate regression analysis demonstrated significant independent associations with occiput posterior position at delivery by intrapartum fetal occipital position, use of oxytocin and Cesarean delivery (Table 2).

Table 2 Significant independent associations with the incidence of occiput posterior position at delivery

Variable	*Odds ratio (95%CI)*	P
Occipital position in labor		< 0.0001
Anterior	1	
Transverse	1.18 (0.41–3.44)	
Posterior	14.22 (5.79–34.94)	
Use of oxytocin	2.38 (1.27–4.45)	0.006
Cesarean section	14.08 (7.89–25.13)	< 0.0001

The findings of occipital position by ultrasound during labor and at delivery are shown in Table 3. During the early stage of active labor (cervical dilatation of 3–5 cm) 33% of the fetuses were in the occiput posterior position, but in 75% of these cases there was rotation during labor so that the occiput at delivery was anterior. In the group assessed at 3–5 cm, there were 46 deliveries in the occiput posterior position and 32 (70%) of these were from the subgroup of occiput posterior at 3–5 cm and 14 (30%) from those in occiput anterior or transverse ($\chi^2 = 12.6$, $P < 0.001$). Similarly, at 6–9 cm cervical dilatation about one-third of the fetuses were in occiput posterior position and in 60% of these there was rotation to the anterior position during labor. In this group there were 35 deliveries in the occiput posterior position and 32 (91%) of these were from the subgroup of occiput posterior during labor ($\chi^2 = 44.8$, $P < 0.0001$). In the patients examined at 10 cm dilatation about 20% were in the occiput posterior position and about half of these persisted in this position to delivery.

DISCUSSION

The data from this study demonstrate that the vast majority of occiput posterior deliveries are the consequence of

Table 3 Fetal occipital position during labor determined by ultrasound and findings at delivery

	Occipital position in labor		*Occipital position at delivery* (n *(%))*		
Cervical dilatation (cm)	*Position*	n *(%)*	*Anterior*	*Transverse*	*Posterior*
3–5 ($n = 452$)	Anterior	133 (29.4)	124 (93.2)	3 (2.3)	6 (4.5)
	Transverse	170 (37.6)	145 (85.3)	17 (10)	8 (4.7)
	Posterior	149 (33.0)	112 (75.1)	5 (3.4)	32 (21.5)
6–9 ($n = 298$)	Anterior	114 (38.2)	113 (99.1)	1 (0.9)	–
	Transverse	83 (27.9)	67 (80.7)	13 (15.7)	3 (3.6)
	Posterior	101 (33.9)	61 (60.4)	8 (7.9)	32 (31.7)
10 ($n = 168$)	Anterior	108 (64.3)	108 (100)	–	–
	Transverse	28 (16.7)	26 (92.9)	2 (7.1)	–
	Posterior	32 (19.0)	17 (53.1)	1 (3.1)	14 (43.8)

failure of rotation from this position during labor, rather than malrotation from an initial occiput anterior or transverse position. Thus, 70%, 91% and 100% of occiput posterior deliveries were in this position at 3–5, 6–9 and 10 cm of cervical dilation, respectively.

The findings that occiput posterior delivery is associated with a high incidence of use of oxytocin during labor and delivery by Cesarean section are compatible with previous reports[1–4,14]. The extent to which accurate diagnosis of fetal occipital position in early active labor and the initiation of active management would reduce the incidence of Cesarean section in addition to maternal and perinatal morbidity remains to be determined[4,13,15].

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