Intrapartum Ultrasonogram for the Determination of Fetal Occiput Position and Risk of Cesarean Section

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Objective: *To evaluate the value of intrapartum ultrasonographically determined occiput position and risk of cesarean section.*
Material and Method: *Between August 1, 2008 and May 31, 2009, 330 singleton pregnant women, GA 37-42 weeks with cephalic presentation who were in early active phase of labor at Thammasat University hospital were recruited. The fetal occiput position was determined by transabdominal ultrasonography. The occiput posterior defined as cases and non-occiput posterior defined as controls. Perinatal outcomes and delivery methods were recorded. Independent sample t-test, Chi-square and multivariable regression were applied for analysis.*
Results: *The incidence of occiput posterior was 29.7%. The abnormal cervical dilatation, cesarean delivery, and newborn weight were statistically significantly higher in cases. 44.9% of cases underwent cesarean section compared to 14.7% of controls.*
Conclusion: *Fetal occiput posterior presentation determined in early stage of active labor by ultrasonography was a significant independent risk of cesarean section.*

Keywords: *Fetal occiput position, Occiput posterior, Intrapartum ultrasonogram, Cesarean section*

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The rising of primary cesarean delivery rate is the major obstetrics concern in most countries. Dystocia is the most common indication and actually a contributing factor in about two-third[1]. Dystocia or feto-pelvic disproportion is not only the miscorrelation of fetal size and maternal pelvic dimension but also the fetal head malrotation. Normally, occiput anterior is the position of fetal head in early labor and the normal sequence mechanism of delivery found is engagement, descent, flexion, internal rotation, extension, and external rotation consecutively. When presenting with occiput posterior, the malrotation could occur causing persistent occiput posterior. Previous studies[2,3] demonstrated the incidence of cesarean section was substantially higher in persistent occiput posterior. In addition, these studies demonstrated that persistent occiput posterior was associated with unfavorable newborn conditions such as Apgar score at 5 minutes less than 7, meconium-stained amniotic fluid and birth trauma[4,5].

Clinically digital examination is generally used to evaluate occiput position. However, the studies found that the intrapartum ultrasonography had significantly higher accuracy than digital examination to evaluate the occiput position, particularly in the early stage of cervical dilatation and labor[6-8]. Moreover, there was no report of the incidence of the fetal head position in the early stage of labor and consequence outcomes in Thailand. Thus, the objective of the present study was to evaluate the value of intrapartum ultrasonographically determined occiput position and risk of caesarean section.

Material and Method

This was a prospective observational study conducted between August 1, 2008 and May 31, 2009 in the labor ward of Thammasat University Hospital, Pathumthani, Thailand. Approval from the local Ethics

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Committee and written consent from all participants were obtained.

Inclusion criteria were pregnant women in the early active phase of labor, singleton, alive fetus in cephalic presentation, term pregnancy with GA $\geq$ 37 weeks and cervical dilate 2-5 cm with effacement > 80%. The exclusion criteria were fetal distress during labor, pregnancy complications; previous cesarean, history of myomectomy, intrauterine growth restriction, preeclampsia-eclampsia, heart disease, antepartum hemorrhage, and women whom the fetal occiput could not be clearly determined by transabdominal sonography.

The authors designed the present study to have 80% power to detect a clinically significant reduction in cesarean section rate in occiput posterior by using a two size method with α = 0.05. From a previous study[9], the cesarean section rate in occiput posterior was 19%. Therefore, the total sample size obtained by calculation was 330 patients.

Transabdominal sonography to determine fetal occiput position was carried out in 347 singleton pregnancies with cephalic presentation in the early stage of active labor (cervical dilatation of 2-5 cm) at 37-42 weeks of gestation. Maternal, fetal and labor characteristics, including maternal age, height, weight, body mass index, gestational age, parity status, whether membranes were intact or ruptured, mode of delivery, and the outcomes of the newborn were obtained from the hospital records of the women. In all women, immediately before or after the routine clinical examination during labor, the fetal occiput position was determined sonographically by two trained researchers. In brief, with the woman in supine position, the ultrasound transducer was placed transversely in the suprapubic region of the maternal abdomen and the occiput position was defined by visualizing the fetal orbits, midline cerebral echo, and cerebellum or occiput as previously described in other studies[7,9]. The position of the fetal spine was determined by obtaining a transverse section of the fetal chest at the four-chamber view of the heart. All women then were cared for in labor by the other attending physicians with blinded results. Data record were analyzed and presented as a percentage (%) and mean $\pm$ SD including the demographic and labor characteristics of the present study population. Independent sample t test was used for comparing continuous numerical variables between non-occiput posterior and occiput posterior group. The Chi-square test was used to compare the categorical data. A p-value < 0.05 was considered as statistically significant. Multivariable analysis, Logistic Regression (Binary logistic regression) for the risk ratio of cesarean delivery was calculated for adjusted OR.

Results

The fetal occiput and spine position were successfully determined by ultrasound examination in 330 women and the examination took less than 5 minutes to complete. During the present study period, 17 women were excluded because 12 cases of the fetal head position could not be clearly evaluated, three cases of fetal distress and two cases of preeclampsia. The mean of maternal age was 27.27 years (range 14-42) and the mean of gestation at examination was 38.9 weeks (range 37-41). Delivery was vaginal in 252 (76.4%) cases and by caesarean section in 78 (23.6%) cases. The incidence of occiput posterior was 29.7% as shown in Table 1. There was no difference of baseline characteristics of participants between non-occiput group and occiput posterior group as shown in Table 2.

In Table 3 demonstrates that the maternal and newborn outcomes with abnormality of cervical dilatation (protracted active phase of dilatation and/or secondary arrest of dilatation), cesarean delivery and newborn weight were statistically significantly higher in the occiput posterior group compared to non-occiput posterior group. However, the Apgar scores at 1 and 5 minutes were not statistically significantly different.

To explore the parameters affecting the cesarean delivery, logistic regression were used for analysis of data in Table 4. Factors that were

Table 1. Baseline characteristics of the study participants

Participants characteristics	n = 330, n (%)
Age (years)*	27.27 $\pm$ 6.02 (14-42)
Weight (kg)*	67.12 $\pm$ 7.76 (52-99)
Height (cm)*	156.70 $\pm$ 3.68 (145-169)
BMI (kg/m^2)*	27.31 $\pm$ 2.87 (20.2-38.2)
Cesarean delivery	78 (23.6)
Vaginal delivery	252 (76.4)
Non-occiput posterior (Occiput anterior and occiput transverse)	232 (70.3)
Occiput posterior	98 (29.7)

* Mean $\pm$ SD (range)

associated with the risk to cesarean delivery are maternal weight, the abnormality of cervical dilatation, newborn weight and the occiput posterior, respectively as demonstrated in Table 4. However, multiparity was the protective factor to cesarean delivery.

Discussion

The findings of the present study demonstrated that the maternal and newborn risk factors to cesarean delivery were maternal weight, abnormality of cervical dilatation, newborn weight and the occiput posterior, respectively. The occiput posterior, determined during the early stage of active labor by the sonographically, was a significant independent risk in the prediction of cesarean delivery. In the occiput posterior group, 44.9% underwent cesarean section, compared to 14.7% of the non-occiput posterior group. These results were similar to a previous study that when occiput posterior

Table 2. Baseline maternal characteristics compared between non- occiput posterior group and occiput posterior group

Baseline maternal characteristics	Non-occiput posterior group n = 232, n (%)	Occiput posterior group n = 98, n (%)	p-value
Age (years)*	27.35 ± 5.96	27.16 ± 6.12	0.624
Weight (kg)*	66.66 ± 7.57	67.73 ± 8.00	0.083
Height(cm)*	156.47 ± 3.65	157.01 ± 3.71	0.257
BMI(kg/m^2)*	27.22 ± 2.91	27.44 ± 2.81	0.170
Gestational age (weeks)*	38.81 ± 1.12	39.06 ± 0.99	0.053
Cervical dilatation (cm)*	3.21 ± 1.00	2.99 ± 0.90	0.052
Nulliparity	135 (58.2%)	64 (65.3%)	0.220
History of abortion	28 (12.1%)	16 (16.3%)	0.300
Intact membranes	171 (73.7%)	74 (74.5%)	0.475
Engagement	70 (30.2%)	28 (28.6%)	0.578

* Mean ± SD

Table 3. Maternal and neonatal outcomes characteristics

Outcomes characteristics	Non-occiput posterior n = 232, n (%)	Occiput posterior n = 98, n (%)	p-value
Abnormality of cervical dilatation	15 (6.5%)	18 (18.4%)	<0.001
cesarean delivery	34 (14.7%)	44 (44.9%)	<0.001
Newborn weight (g)*	3,127.49 ± 354.34	3,329.86 ± 347.27	<0.001
Apgar at 1 min < 7	0 (0)	1 (1%)	0.410
Apgar at 5 min < 7	0 (0)	0 (0%)	NA

* Mean ± SD, NA = not available

Table 4. Adjusted risk ratio of cesarean delivery

Parameter	Odds ratio	95% CI	p-value
Age	0.937	0.85-1.02	0.140
Maternal weight	2.065	1.19-3.56	0.009
Height	0.458	0.27-0.76	0.003
Multiparity	0.15	0.01-0.21	<0.001
Engagement	0.39	0.06-1.02	0.055
Intact membranes	0.283	0.07-1.09	0.068
Abnormality of cervical dilatation	33.78	8.53-133	<0.001
Newborn weight	1.003	1.002-1.005	<0.001
Occiput posterior	12.29	3.55-42.46	<0.001

was the presenting part in early labor, the risk of cesarean delivery would much increase[2,9]. With this strategy, the authors can identify a subgroup of high-risk women for caesarean section that may necessitate a higher level of intensive care.

Digitally vaginal examination had higher error rate particularly when the cervical dilatation is minimal. Transabdominal sonogram had been suggested as the gold standard for intraparum assessment of fetal head position related to its accuracy and non-invasiveness[6-8]. However, the cost-benefit analyses are necessary to determine if routine use should be recommended.

The most indications of cesarean delivery in the present study were failure to progress in labor and cephalopelvic disproportion (CPD). This high incidence of CPD mainly due to failure of rotation from an initial occiput posterior position in the first stage of labor. In the early stage of active labor, the fetal head negotiates, most commonly in the occiput lateral position, the transverse diameter of the pelvic inlet. The diameter and circumference of the presenting head are wider if occiput posterior is in the presenting position. This could be attributed to deflexion of the fetal head.

Prolonged duration of labor and abnormal cervical dilatation were also found in the present study as well as the previous reports[10,11]. However, the immediate newborn outcomes, both Apgar scores at 1, 5 minutes were similar in both groups. This inconsistent finding to previous reports[4,5] might be explained by the limitation of the present study. The newborn outcome was not a primary objective and the incidences of these adverse events were low. In addition, only low risk pregnant women were selected in the present study.

To the author's knowledge, there was no previous report of the incidence of occiput posterior in early labor in Thailand. Generally, the incidence was 10-20%[5,11] but the present finding was 29.7%. This probably high incidence could warn us that the malposition might be higher than previously thought. The procedure for prevention malposition at antenatal care and the maneuvers for correction malrotation in labor might have a major role for decreasing this obstructed labor and the primary cesarean section rate[12-14].

The authors accept that there were several limitations of the present study. Firstly, the final head positions at delivery were not recorded and the mechanism that occiput posterior could rotate to occiput anterior should be explored. Secondly, the information of the amount of oxytocin and types of anesthesia, which might have a significant effect to routes of deliveries, were not collected. Thirdly, the attending physicians were blinded for the ultrasonogram results but their labor cares had a variety of managements. In addition, the present study has not enough information to confirm that ultrasonogram evaluation is better than clinically digital examination.

In conclusion, the present study addressed the value of transabdominal intrapartum sonogram for diagnosis of fetal occiput posterior position in associated with the risk of cesarean delivery. The presented model could be used as a tool of identifying a high-risk group for caesarean section and managing as intensively care of labor. However, before such a policy is adopted, more studies, probably randomized controlled trial are necessary and a cost-benefit analysis should be evaluated.

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การประเมินท่าศีรษะทารกในระยะแรกของการเจ็บครรภ์โดยใช้คลื่นเสียงความถี่สูงทางหน้าท้องกับความเสี่ยงต่อการผ่าตัดคลอด

แพร ทรัพย์สำรวย, ชำนาญ แท่นประเสริฐกุล

วัตถุประสงค์*: เพื่อประเมินคุณค่าของการตรวจคลื่นเสียงความถี่สูงทางหน้าท้อง ในการประเมินท่าศีรษะทารกกับความเสี่ยงในการผ่าตัดคลอด*

วัสดุและวิธีการ*: ได้ศึกษาในสตรีตั้งครรภ์เดี่ยว จำนวน 330 คน ตั้งแต่ 1 สิงหาคม พ.ศ. 2551 ถึง 31 พฤษภาคม พ.ศ. 2552 อายุครรภ์ 37 ถึง 42 สัปดาห์ ทารกมีส่วนนำเป็นศีรษะ และอยู่ในระยะแรกของการเจ็บครรภ์ที่ห้องคลอด โรงพยาบาลธรรมศาสตร์ โดยทารกในครรภ์ได้รับการประเมินตำแหน่ง occiput โดยคลื่นเสียงความถี่สูงทางหน้าท้อง ข้อมูลปริกำเนิด และวิธีการคลอดได้รับการบันทึก และวิเคราะห์ทางสถิติ*

ผลการศึกษา*: อุบัติการณ์ของท่าศีรษะทารกในครรภ์ที่เป็น occiput posterior พบร้อยละ 29.7 การเปิดของปากมดลูกที่ผิดปกติการผ่าตัดคลอด และน้ำหนักทารกแรกคลอดในกลุ่ม occiput posterior สูงกว่าในกลุ่ม non-occiput posterior อย่างมีนัยสำคัญโดยมีอัตราการผ่าตัดคลอดคิดเป็นร้อยละ 44.9 และ 14.7 ตามลำดับ*

สรุป*: ท่า occiput posterior ในระยะแรกของการเจ็บครรภ์ซึ่งประเมินโดยการตรวจด้วยคลื่นเสียงความถี่สูงทางหน้าท้องเป็นปัจจัยเสี่ยงของการผ่าตัดคลอด*