Is it time for routine ultrasound in late pregnancy at Bhumibol Adulyadej Hospital?

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Background: At term, about 3-5% of the presentations are breech. Vaginal breech deliveries are associated with increased maternal and fetal morbidity and mortality, but delivery by cesarean section in an emergency does not eliminate all maternal and perinatal morbidity. The use of external cephalic version can produce considerable cost savings in the management of the breech fetus at term. The accuracy in the assessment of fetal presentation and position is essential.

Objective: To study the accuracy of Leopold's maneuvers in the assessment of fetal presentation and position at Bhumibol Adulyadej Hospital.

Material and Method: Prospective cohort study of 1,528 singletons, pregnant women at gestational age between 34-40 weeks who attended antenatal care unit at Bhumibol Adulyadej Hospital between November 1, 2006 and March 30, 2009. All cases were examined by either residents or staff by using Leopold's maneuvers. The results of the examinations were recorded as cephalic or non-cephalic presentation. After that, the subjects were re-examined by the staff in the maternal and fetal medicine unit using ultrasound for gold standard. Maternal age, weight, height, gestational age, parity, estimated fetal weight, amniotic fluid index, placental site, and fetal presentation were recorded. The results of the two methods of examination were then analyzed for comparison and calculated in terms of means, standard deviation, sensitivity, specificity, positive predictive value, negative predictive value, and accuracy.

Results: The results of Leopold's maneuvers with 95% confidence interval revealed sensitivity $63.17 \pm 10.84\%$, specificity $93.35 \pm 1.25\%$, positive predictive value $34.04 \pm 7.82\%$, negative predictive value $97.98 \pm 0.74\%$, and accuracy $92.08 \pm 1.35\%$.

Conclusion: Leopold's maneuvers are inexpensive, easy to perform, and noninvasive but the accuracy of such assessments vary depending on many factors especially experience of operators. The caregivers can reduce perinatal morbidity and mortality if they can diagnose all of non-vertex presentation in near term pregnancy. Routine use of ultrasound in near term pregnancy to diagnose non-vertex presentation has more benefit than cost.

Keywords: Leopold's maneuvers, Non-vertex presentation, External cephalic version

The accurate assessment of fetal presentation and position is essential to appropriate management of term pregnancy. Knowledge of the fetal presentation and position facilitates the appropriate choice of the route of delivery, place of delivery and the choice of external cephalic version in cases of breech presentation[1]. The incidences of various presentations are approximately 96.8% cephalic presentation, 2.7% breech presentation, 0.3% transverse lie, 0.1% compound presentation, 0.5% face presentation, and 0.01% brow presentation[2]. That means the incidence of non-vertex presentation is approximately 4%. Perinatal mortality and morbidity are increased in fetal malpresentation[3]. Retrospective studies comparing breech and vertex presentation at term have shown a perinatal mortality rate ratio of 4.3:1 to 2:1 and a perinatal morbidity rate ratio of 5:1 (asphyxia), 4:1 (neurological), and 2.2:1 (traumatic damage)[4]. The overall neonatal mortality and morbidity resulting from trauma were increased significantly in the unplanned delivery groups.

Four methods can be used to assess fetal presentation and position, x-rays, ultrasound, pelvic examination, and Leopold's maneuvers. Pelvic examination and x-rays are inappropriate for current

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practice. Leopold's maneuvers have become one of the core skills for medical students and residents to acquire during their training. The American College of Obstetricians and Gynecologists (ACOG) recommends Leopold's maneuvers and the measurement of uterine fundus as the primary method for clinical estimation of fetal weight[5]. However, its sensitivity and specificity are variable[6-10]. Moreover, its accuracy depends on the examiner's experience[11]. In the present study the authors aimed to determine how accurate Leopold's maneuvers were in late pregnancy and is it time for routine ultrasound in late pregnancy to reduce perinatal morbidity and mortality in non-vertex fetus. Ultrasound assessments of fetal presentation and position are gold standard, however, the method requires considerable skill[12], but now it is available at Bhumibol Adulyadej Hospital and most hospitals in Thailand.

Material and Method

The present study was designed as a prospective descriptive study and was performed in the antenatal care unit, Department of Obstetrics and Gynecology, Bhumibol Adulyadej Hospital between November 1, 2006 and March 30, 2009. One thousand five hundred and twenty eight singleton, pregnant women who had a gestational age between 34-40 weeks, confirmed by ultrasound, and were enrolled in the present study. The identification data of the patients would be recorded as follows: maternal age, gestational age, weight, height, parity, AFI (amniotic fluid index), placental site, BMI, and experience of physicians. All subjects were examined by physicians using Leopold's maneuvers. The results of the examinations were recorded. After that, the subjects would be reexamined by the staff in the maternal and fetal medicine unit using ultrasound for gold standard without knowledge of the results from previous abdominal examination.

The results of the two methods of examination were then analyzed for comparison. The identification data were reported in terms of mean, standard deviation, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy with 95% confidence interval (95% CI). The present study was approved by Bhumibol Adulyadej Hospital Ethics Committee.

Results

One thousand five hundred twenty eight singletons, pregnant women attended antenatal care unit of Bhumibol Adulyadej Hospital between November 1, 2006 and March 30, 2009 at a gestational age between 34-40 weeks. The incidence of non-vertex presentation was 4.97%. Mean of maternal age standard deviation (SD), maternal weight, BMI, and fetal weight were 26.11 ± 6.05 years, 65.07 ± 8.58 kg, 26.15 ± 3.24 kg/m^2, and $3,220.30 \pm 210.58$ grams, respectively (Table 1). Sensitivity $\pm$ 95% CI for diagnosis of non-vertex presentation was $63.17 \pm 10.84\%$ and specificity was $93.35 \pm 1.25\%$. Positive predictive value to diagnosis non-vertex presentation by Leopold's maneuvers quite low but Negative predictive value was high as shown in Table 2. Many confounding factors such as gestational age, parity, BMI, AFI, placental site, fetal weight, and experience of operators were studied (Table 2).

Discussion

The prevalence of non-vertex presentation at Bhumibol Adulyadej Hospital was 4.97%. It was higher than Parkland Hospital[2]. To decrease perinatal morbidity and mortality in near-term breech presentation, many factors are involved. Several authors have reported success rates and low complications for external cephalic version at term in routine clinical practice[13-17]. Well planned delivery was the other important factor. In cases of abnormal presentation, team approach including, obstetricians, pediatricians, anesthesiologists, and nurses are necessary.

The present study was conducted with the main objective to determine the accuracy of Leopold's maneuvers in terms of sensitivity, specificity, positive predictive value, negative predictive value,

Table 1. Demographic data (n = 1,528)

	Mean $\pm$ SD	Minimum	Maximum
Age (years)	26.11 ± 6.05	15	40
BMI (kg/m^2)	26.15 ± 3.24	19.28	37.25
Maternal weight (kg)	65.07 ± 8.59	45.0	92.70
Fetal weight (grams)	$3,220.30 \pm 210.58$	2,680	3,710

Table 2. Probability for none-vertex diagnosis

	Sensitivity % ± 95% CI	Specificity % ± 95% CI	PPV % ± 95% CI	NPV % ± 95% CI	Accuracy % ± 95% CI
All case	63.17 ± 10.84	93.35 ± 1.25	34.04 ± 7.82	97.98 ± 0.74	92.08 ± 1.35
Age < 35 years	67.18 ± 11.50	97.36 ± 0.90	57.33 ± 11.19	98.25 ± 0.74	95.84 ± 1.09
Age ≥ 35 years	58.33 ± 27.89	96.93 ± 2.64	58.33 ± 27.89	96.93 ± 2.64	94.28 ± 3.49
GA 34-36 weeks	36.84 ± 12.15	96.72 ± 1.29	48.83 ± 16.88	94.75 ± 2.33	92.04 ± 6.78
GA 37-39 weeks	38.46 ± 10.83	97.51 ± 1.11	55.55 ± 15.55	95.15 ± 4.78	93.10 ± 4.66
GA ≥ 40 weeks	70.00 ± 14.66	94.11 ± 2.56	87.50 ± 8.65	84.20 ± 8.95	85.18 ± 7.34
Parity 0	62.06 ± 17.66	97.93 ± 1.03	54.54 ± 16.98	98.47 ± 0.89	96.55 ± 1.30
Parity ≥ 1	63.82 ± 13.73	96.62 ± 1.38	57.69 ± 13.42	97.36 ± 1.23	94.41 ± 1.70
BMI < 25 kg/m^2	59.67 ± 12.21	97.18 ± 0.96	53.62 ± 11.76	97.78 ± 0.85	95.24 ± 1.20
BMI ≥ 25 kg/m^2	78.57 ± 21.49	97.46 ± 1.99	64.70 ± 22.71	98.71 ± 1.44	96.41 ± 2.30
Resident	50.00 ± 12.65	97.65 ± 0.91	54.54 ± 13.15	97.19 ± 0.99	95.10 ± 1.26
Staff	75.00 ± 21.21	97.43 ± 1.75	60.00 ± 21.47	98.70 ± 1.26	96.34 ± 2.03
AFI < 25	53.57 ± 13.06	94.88 ± 1.38	37.50 ± 10.60	97.27 ± 1.03	92.64 ± 1.59
AFI ≥ 25	40.00 ± 21.47	94.51 ± 2.04	23.52 ± 14.25	97.39 ± 1.45	92.30 ± 2.34
FW < 2,500 grams	37.50 ± 15.00	82.03 ± 6.65	39.47 ± 15.54	80.76 ± 6.77	71.42 ± 6.83
FW ≥ 2,500 grams	52.77 ± 16.03	97.58 ± 0.83	37.25 ± 13.26	98.70 ± 0.61	96.39 ± 0.99
Placenta anterior	35.71 ± 17.74	94.81 ± 2.21	33.33 ± 16.86	95.31 ± 2.11	90.82 ± 2.78
Placenta other site	54.16 ± 14.09	96.76 ± 1.10	44.82 ± 12.79	97.75 ± 0.92	94.79 ± 1.35

GA = gestational age; BMI = body mass index; AFI = amniotic fluid index; FW = fetal weight

and accuracy. The present study found sensitivity (63.17 ± 10.84%) was higher than Nassar N et al (55%)[8] and Thorp J M et al (28%)[7] and was lower than Lydon-Rochelle M et al (88%) and[9] McFarlin BL et al (85.3%)[1]. Leopold's maneuvers are still common in daily obstetric practice in the United Arab Emirates and most developed and developing countries[18]. These maneuvers have become one of the core skills for medical students and residents to acquire during their training because it is inexpensive, easy to perform, and noninvasive. However, the accuracy of such assessments vary depending on many factors especially experience of operators. External cephalic version is apparently safe and highly successful when it is attempted in proper conditions. It is effective in reducing perinatal morbidity and mortality rates of vaginal breech delivery and cesarean section.

Although non-vertex presentation in near term pregnancy is quite low, if the caregivers can diagnose all of them exactly, they can reduce perinatal morbidity and mortality. Nowadays ultrasound equipment and skill-operators to diagnose fetal presentation are available in most hospitals in Thailand. It is safe, easy to use, and highly accurate in predicting fetal presentation. The authors believed that routine use of ultrasound in near-term pregnancy to diagnose non-vertex presentation has more benefit than cost.

Conclusion

Leopold's maneuvers are still common in daily obstetrics practice at Bhumibol Adulyadej Hospital. Sensitivity for diagnosis of non-vertex presentation by Leopold's maneuvers was 63.17 ± 10.84% and specificity was 93.35 ± 1.25%. External cephalic version is effective in reducing perinatal morbidity and mortality rates of vaginal breech delivery and cesarean section. Nowadays ultrasound equipment and skilled-operators to diagnose fetal presentation are available at Bhumibol Adulyadej Hospital. The authors believe that routine use of ultrasound in near-term pregnancy to diagnose non-vertex presentation has more benefit than cost.

References

1. McFarlin BL, Engstrom JL, Sampson MB, Cattledge F. Concurrent validity of Leopold's maneuvers in determining fetal presentation and position. J Nurse Midwifery 1985; 30: 280-4.
2. Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Gilstrap LC III, Wenstrom KD. Normal labor and delivery. In: Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Gilstrap LC III, Wenstrom KD. Williams obstetrics. 22nd ed. New York: McGraw-Hill; 2005: 409-41.
3. Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Gilstrap LC III, Wenstrom KD. Breech presentation

and delivery. In: Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Gilstrap LC III, Wenstrom KD. Williams Obstetrics. 22nd ed. New York: McGraw-Hill; 2005: 565-86.

4. Kauppila O. The perinatal mortality in breech deliveries and observations on affecting factors. A retrospective study of 2227 cases. Acta Obstet Gynecol Scand Suppl 1975; 39: 1-79.

5. Chatfield J. ACOG issues guidelines on fetal macrosomia. American College of Obstetricians and Gynecologists. Am Fam Physician 2001; 64: 169-70.

6. Engstrom JL, McFarlin BL, Sittler CP. Fundal height measurement. Part 2—Intra- and interexaminer reliability of three measurement techniques. J Nurse Midwifery 1993; 38: 17-22.

7. Thorp JM Jr, Jenkins T, Watson W. Utility of Leopold maneuvers in screening for malpresentation. Obstet Gynecol 1991; 78: 394-6.

8. Nassar N, Roberts CL, Cameron CA, Olive EC. Diagnostic accuracy of clinical examination for detection of non-cephalic presentation in late pregnancy: cross sectional analytic study. BMJ 2006; 333: 578-80.

9. Lydon-Rochelle M, Albers L, Gorwoda J, Craig E, Qualls C. Accuracy of Leopold maneuvers in screening for malpresentation: a prospective study. Birth 1993; 20: 132-5.

10. Nahum GG. Predicting fetal weight. Are Leopold's maneuvers still worth teaching to medical students and house staff? J Reprod Med 2002; 47: 271-8.

11. Watson WJ, Welter S, Day D. Antepartum identification of breech presentation. J Reprod Med 2004; 49: 294-6.

12. Callen PW. The obstetrics ultrasound examination. In: Callen PW, editor. Ultrasonography in obstetrics and gynecology. 5th ed. Philadelphia: Saunders/Elsevier; 2008: 1-25.

13. Boucher M, Bujold E, Marquette GP, Vezina Y. The relationship between amniotic fluid index and successful external cephalic version: a 14-year experience. Am J Obstet Gynecol 2003; 189: 751-4.

14. Impey L, Lissoni D. Outcome of external cephalic version after 36 weeks' gestation without tocolysis. J Matern Fetal Med 1999; 8: 203-7.

15. Impey L, Pandit M. Tocolysis for repeat external cephalic version in breech presentation at term: a randomised, double-blinded, placebo-controlled trial. BJOG 2005; 112: 627-31.

16. Collaris RJ, Oei SG. External cephalic version: a safe procedure? A systematic review of version-related risks. Acta Obstet Gynecol Scand 2004; 83: 511-8.

17. Rueangchainikhom W, Sarapak S, Prommas S. Efficacy of external cephalic version with tocolysis in late pregnancy. J Med Assoc Thai 2008; 91: 19-24.

18. Mirghani HM, Khair H, Ahmed B. Leopold's maneuvers: How common is it in our daily practice? Gynaecol Perinatol 2007; 16: 79-82.

ความแม่นยำของการตรวจครรภ์ทางหน้าท้องด้วยวิธี *leopold's maneuvers* ในการตรวจคัดกรอง ส่วนนำที่ผิดปรกติของทารกอายุครรภ์ 34-40 สัปดาห์ในโรงพยาบาลภูมิพลอดุลยเดช

วิบูลย์ เรืองชัยนิคม, สินาท พรหมมาศ, สราวุธ สารภักดิ์

วัตถุประสงค์: *เพื่อศึกษาความแม่นยำของการตรวจครรภ์ทางหน้าท้องด้วยวิธี leopold's maneuvers ในการตรวจคัดกรองส่วนนำที่ผิดปรกติของทารกอายุครรภ์ 34-40 สัปดาห์ในโรงพยาบาลภูมิพลอดุลยเดช*

วัสดุและวิธีการ: *เป็นการวิจัยแบบเชิงพรรณนาโดยเก็บข้อมูลในหญิงตั้งครรภ์เดี่ยวอายุครรภ์ 34-40 สัปดาห์ ที่แผนกผู้ป่วยนอก กองสูตินรีเวชกรรมโรงพยาบาลภูมิพลอดุลยเดชตั้งแต่วันที่ 1 พฤศจิกายน พ.ศ. 2549 ถึง 30 มีนาคม พ.ศ. 2552 ได้หญิงตั้งครรภ์รวม 1,528 ราย โดยหญิงตั้งครรภ์ทุกคนจะได้รับการตรวจหาท่าของทารกทางหน้าท้องด้วยวิธี leopold's maneuvers และได้รับการตรวจยืนยันอีกครั้งด้วยเครื่องตรวจคลื่นเสียงความถี่สูง*

ผลการศึกษา: *พบอุบัติการณ์ของทารกที่ไม่ใช่ท่าศีรษะร้อยละ 4.97 พบความไวในการตรวจทางหน้าท้องเพื่อวินิจฉัยทารกท่าก้นเพียงร้อยละ 63.17 ± 10.84 และความจำเพาะร้อยละ 93.35 ± 1.25*

สรุป: *การตรวจครรภ์ทางหน้าท้องด้วยวิธี leopold's maneuvers ในการตรวจคัดกรองส่วนนำที่ผิดปรกติของทารกใกล้คลอดมีความไวไม่ดีพอ อาจทำให้ทารกท่าก้นคลอด และเกิดอันตรายแทรกซ้อนได้ในปัจจุบันเครื่องตรวจคลื่นเสียงความถี่สูงมีราคาถูก และมีใช้เกือบทุกโรงพยาบาล ถ้านำมาใช้ตรวจหาส่วนนำที่ผิดปรกติของทารกใกล้คลอด จะสามารถวางแผนลดภาวะแทรกซ้อนจากการคลอดทารกท่าก้นได้อย่างมีประสิทธิภาพ*