# Correlation of Uterine Cervical Length Measurement from Transabdominal, Transperineal and Transvaginal Ultrasonography

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## Abstract

**Objective :** To investigate the feasibility of transperineal ultrasonography for uterine cervical assessment by determining the correlation of uterine cervical length measurement from transabdominal, transperineal and transvaginal ultrasonography and comparing discomfort arising from each technique.

**Material and Method :** Fifty pregnant women of 37 weeks' gestation or later who gave consent participated in this research. They had no exclusion criteria, which were listed as the following: preterm premature rupture of membranes, previous cervical surgery, undiagnosed vaginal bleeding, and true labor pain. They all underwent transabdominal (3.5-MHz curvilinear transducer), transperineal (3.5-MHz curvilinear transducer) and transvaginal ultrasonography (7.5-MHz curvilinear endovaginal transducer). The uterine cervical length was measured from the straight line between the external and internal os. If either of the external or internal os was not clearly demonstrated, the authors would justify the cervical length as non-measurable. Measurement in each technique was performed twice and the mean cervical length was used for data analysis. Discomfort arising from each technique was evaluated by visual analog scale.

**Results :** Uterine cervical length was measurable in 23 (46%), 49 (98%) and in all cases by transabdominal, transperineal and transvaginal ultrasonography respectively. In the transabdominal technique, no significant differences in woman's age, weight, body-mass index and parity were observed between measurable and non-measurable cases. Significant correlation was demonstrated between transperineal and transvaginal ultrasound ($r = 0.73$, $p < 0.01$). A significantly higher discomfort score was

demonstrated in transvaginal ultrasonography, but no significant difference in discomfort score was found between transabdominal and transperineal ultrasonography.

       **Conclusion :** Transperineal ultrasonography is feasible for acceptable uterine cervical visualization with only slight discomfort to the patients.

**Key word :** Uterine Cervical Length, Ultrasonography, Transperineal Sonography

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Sonographic uterine cervical assessment during pregnancy is performed for many reasons: assessment of the risk for preterm delivery by cervical length measurement, preinduction cervical assessment and diagnosis of cervical incompetence, placenta previa, vasa previa and placenta accreta[1,2]. Assessment of the risk for preterm delivery and diagnosis of placenta previa are the most common reasons. In a non-pregnant state and in the first half of pregnancy, the uterine cervix is not easily distinguishable from the lower uterine segment. However, by the mid second trimester, the amniotic sac provides a clearly defined landmark for the internal cervical os that makes it easier to evaluate[2]. Transperineal and transvaginal ultrasonography provide better visualization of the cervix than transabdominal ultrasonography. Limitation of transabdominal ultrasonography can be due to patient size, overlying fetal structures and volume of urine in the urinary bladder[1]. Transperineal and transvaginal ultrasonography can overcome these limitations of transabdominal ultrasonography and provides adequate visualization of the uterine cervix[1]. Both transperineal and transvaginal ultrasonography have similar techniques, but utilize different transducers. In both techniques, the bladder should be emptied and the scanning should be performed with the hip abducted and elevated on a bolster in the supine position. Transperineal ultrasonography needs a 3.5-

5.0 MHz convex transducer (which is the same as the transabdominal transducer) while transvaginal ultrasonography needs a specific design 5.0-10.0 MHz convex transducer with appropriate covering for hygienic purposes[2]. The transperineal technique may be suitable for a primary care unit where a transvaginal transducer is not available. The aim of this study was to evaluate the feasibility of transperineal ultrasonography for uterine cervical assessment by determining the correlation of cervical length measurement from transabdominal, transperineal and transvaginal ultrasonography and comparing discomfort arising from each technique.

**MATERIAL AND METHOD**

       The study was conducted in the Maternal Fetal Medicine Unit, Department of Obstetric and Gynecology, Siriraj Hospital. Fifty pregnant women of 37 weeks' gestation or later consented to participate in this study. The exclusion criteria included preterm premature rupture of membranes, previous cervical surgery, undiagnosed vaginal bleeding, and true labor pain. For each patient, transabdominal, transperineal and transvaginal ultrasonography was performed to assess the uterine cervical length. For transabdominal ultrasonography, all the pregnant women were asked to abstain voiding for 2-4 hours and placed in the supine position. A 3.5-MHz curvilinear transducer

was used (Aloka 1700; Aloka Co., Ltd, Tokyo, Japan). A transducer was placed sagittally over the suprapubic area and moved until the true sagittal view of the uterine cervix was obtained. Sonolucent endocervical mucosa was used as a guide to find the true external and internal os. The uterine cervical length was measured along the straight line between the external and internal os. If either of the external or internal os was not clearly demonstrated, the authors would justify the cervical length as non-measurable. Subsequently, all the pregnant women were asked to empty their bladder and were placed in the supine position with hip abducted and elevated on a bolster [3]. For transperineal ultrasonography, the same 3.5-MHz curvilinear transducer with appropriate covering was used. The transducer was placed sagittally on the anterior perineum and moved until a proper plain was obtained. The uterine cervical length was measured in the same manner. For transvaginal ultrasonography, a 7.5-MHz curvilinear endovaginal transducer with appropriate covering was used (Aloka 1700; Aloka Co., Ltd, Tokyo, Japan). The transducer was placed in the anterior fornix of the vagina and care was taken to avoid exerting undue pressure on the cervix, which may artificially lengthen it[1,4]. The uterine cervical length was measured in the same manner. Two measurements were performed for each technique and the mean cervical length was used for data analysis. Discomfort arising from each technique was evaluated by visual analog scale. This study was approved by the Ethical Committee on Research Involving Human Subjects, Faculty of Medicine Siriraj Hospital, Mahidol University.

## RESULTS

During the study period, 50 pregnant women were enrolled, and their characteristics are shown in Table 1. Uterine cervical length was measurable in 23 (46%), 49 (98%) and in all cases by transabdominal, transperineal and transvaginal ultrasonography respectively. Fig. 1 illustrates the sonographic pic-
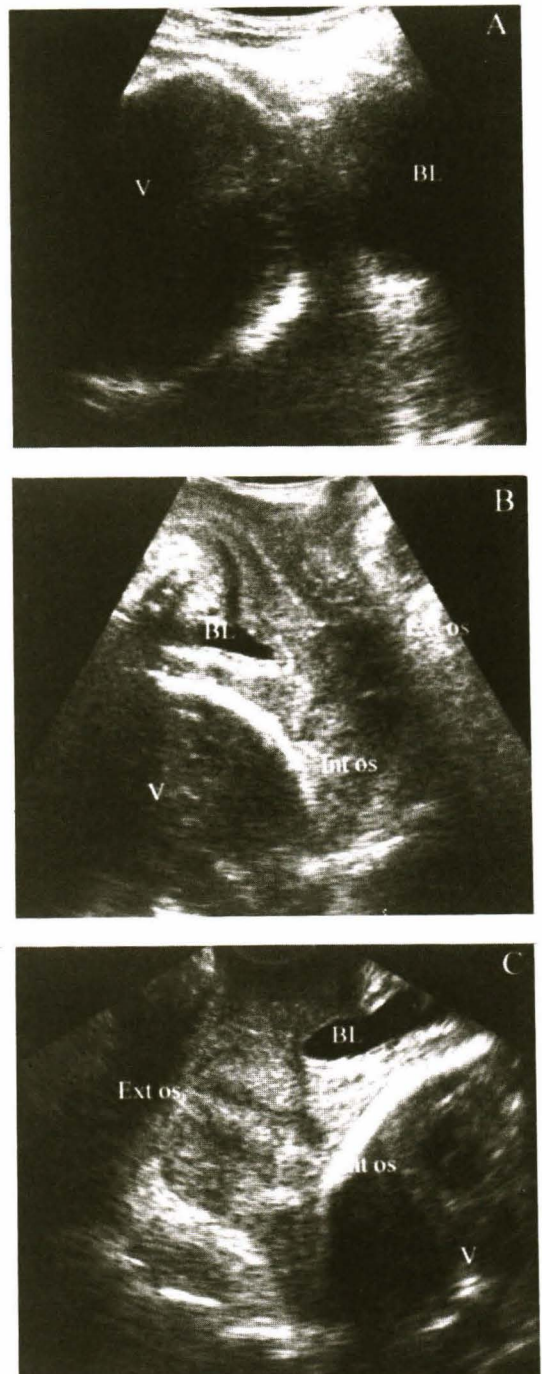
**Table 1.    Characteristics of the pregnant women.**

| Characteristics | Range | Mean ± SD |
|---|---|---|
| Age (years) | 15-38 | 26.00 ± 6.27 |
| Gestational age (weeks) | 37-41 | 38.76 ± 1.25 |
| Weight (kg) | 45-92 | 65.07 ± 9.73 |
| Height (cm) | 143-169 | 156 ± 5.50 |
| Body mass index (kg/m$^2$) | 16.94-35.94 | 26.57 ± 3.73 |



**Fig. 1.**    Uterine cervical ultrasonography from the same case that was visualized inadequately by transabdominal ultrasonography A), but visualized adequately by transperineal B) and transvaginal ultrasonography C). (V = vertex, BL = bladder, Ext os = external os, Int os = internal os)

tures obtained from one pregnant woman in the study by each technique. In this case, a better result was achieved using transvaginal and transperineal compared to transabdominal sonography. With the transabdominal technique, there was no significant difference in the women's age, weight, body-mass index and parity between measurable and non-measurable cases. Correlations of cervical length measurement between the three techniques are demonstrated by scatter plot diagrams as shown in Fig. 2-4. Significant correlation was demonstrated between transperineal and trasvaginal ultrasound only ($r = 0.73$, $p < 0.01$). Comparisons of discomfort arising from each technique are shown in Table 2. A significantly higher discomfort score was demonstrated in transvaginal ultrasonography, but no significant difference in discomfort score between transabdominal and transperineal ultrasonography was observed.

## DISCUSSION

Uterine cervical length obtained by transabdominal ultrasonography demonstrates not only the need for bladder filling to improve visualization but also the drawback of bladder filling which causes artificial lengthening of cervix. One study showed that the percentage of cases in which the cervix could be seen transabdominally at mid trimester increased from 42 per cent for bladder volume < 50 ml to 73 per cent for volume > 150 ml[5]. In the present study, uterine cervical length was measured in only 46 per cent of cases by transabdominal ultrasonography. The authors found that visualization of the cervix by transabdominal technique was unrelated to age, weight, body-mass index and parity. This was similar to a previous report[5]. Engagement of a fetal part might have played an important role to limit cervical visualization in the third trimester.

Uterine cervical length measurement by transvaginal ultrasonography gives the best visualization of the cervix when compared to other techniques, the cervix can be seen in 83-100 per cent of cases[6-9]. In the present study, the cervix was seen and measured in all cases by transvaginal ultrasonography. Transperineal ultrasonography was proved to be an alternative method, enabling adequate visualization of the cervix in 98 per cent of cases. The present findings
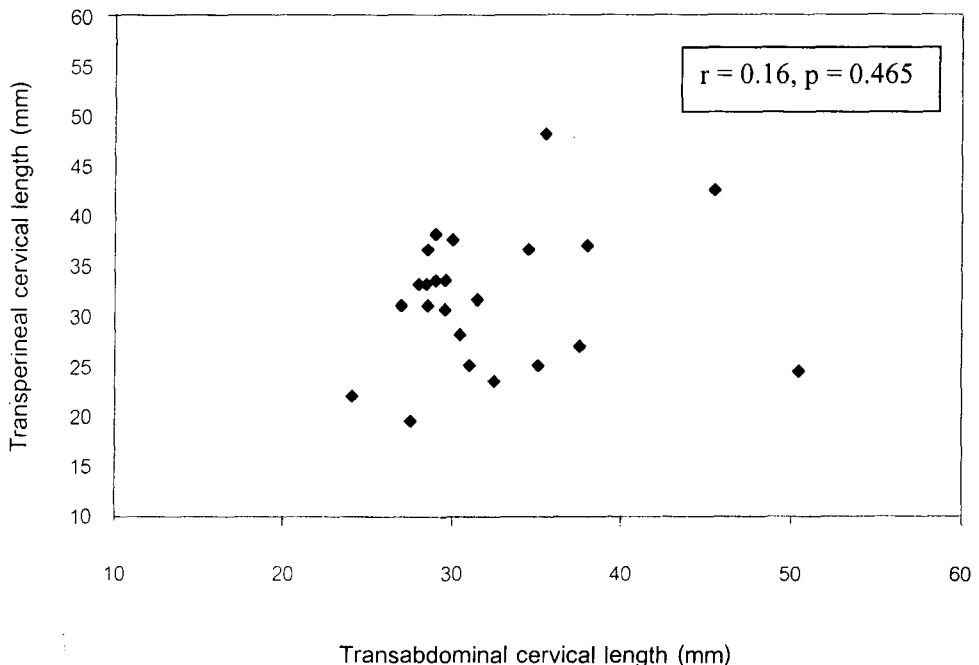


Fig. 2.   Relationship between uterine cervical length measurements by transperineal and transabdominal ultrasonography in the 23 pregnant women.
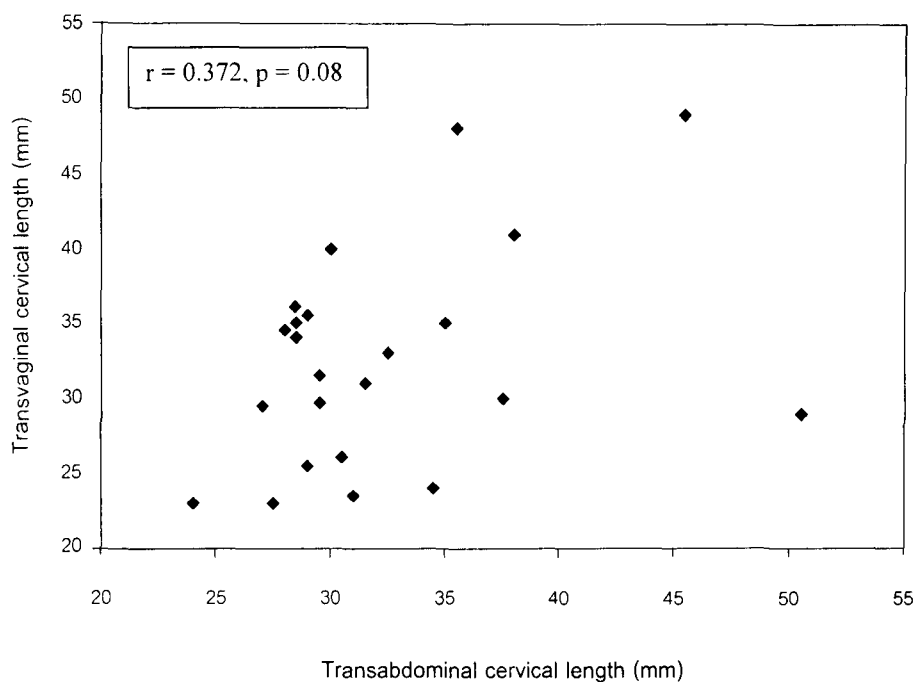
**Fig. 3.** Relationship between uterine cervical length measurements by transvaginal and transabdominal ultrasonography in the 23 pregnant women.
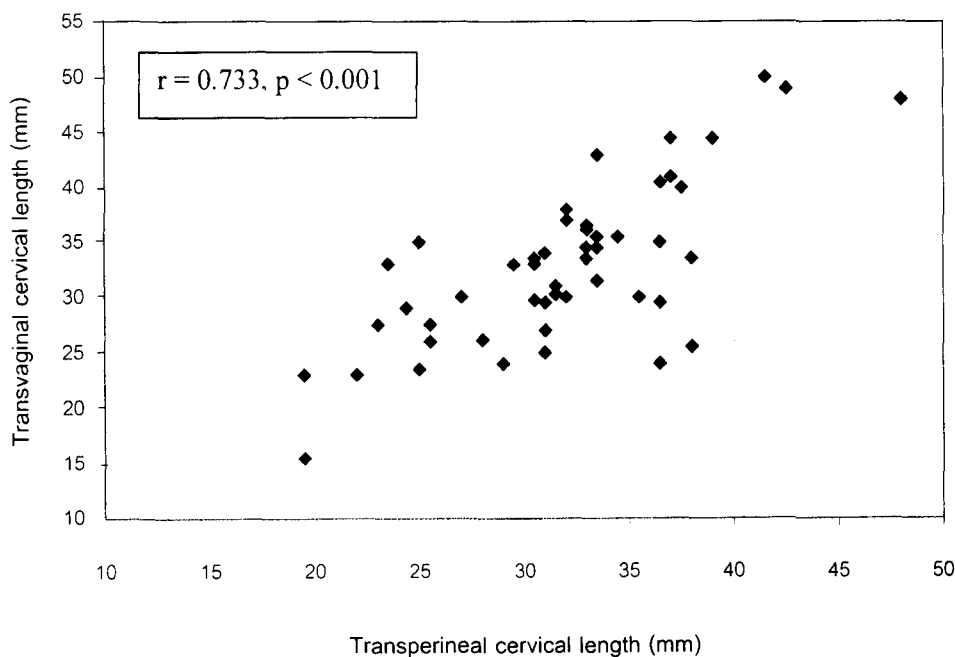


**Fig. 4.** Relationship between uterine cervical length measurements by transvaginal and transperineal ultrasonography in the 49 pregnant women.

**Table 2.    Comparisons of discomfort score arising from each technique.**

| Techniques | Median (interquartile range) | P |
|---|---|---|
| Transabdominal | 0.40 (0.30-1.35) | 0.90 |
| Transperineal | 0.50 (0.30-1.70) | |
| Transabdominal | 0.40 (0.30-1.35) | < 0.01 |
| Transvaginal | 1.30 (0.40-3.18) | |
| Transperineal | 0.50 (0.30-1.70) | < 0.01 |
| Transvaginal | 1.30 (0.40-3.18) | |

were in agreement with previous reports where transperineal ultrasonography gave adequate visualization of the cervix in 78-96 per cent of cases[6,7,10]. In addition, cervical length measurement was significantly correlated with that obtained from the transvaginal technique[6,7,11]. In the present study, a low discomfort score was found in all techniques, with the highest score from the transvaginal technique.

Uterine cervical study by transperineal ultrasonography is possibly the method of choice when potential complications, that digital examination or transvaginal ultrasonography of the cervix such as the risk of infection in preterm premature rupture of membranes or bleeding tendency in placenta previa, are anticipated[1]. Previous studies showed a correlation between transperineal ultrasonography and digital vaginal examination of cervical length and dilatation [10,12]. In which case both techniques may be used interchangeably. Also, transperineal ultasonography may be suitable for a primary care unit where a transvaginal transducer is not available. In conclusion, transperineal ultrasonography enabled acceptable visualization of the cervix with slight discomfort to the patients.

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# ความสัมพันธ์ระหว่างความยาวปากมดลูกที่วัดได้จากการตรวจด้วยคลื่นเสียงความถี่สูง ทางหน้าท้อง, ทางฝีเย็บและทางช่องคลอด

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**วัตถุประสงค์** : เพื่อศึกษาความสัมพันธ์ระหว่างความยาวของปากมดลูก และความรู้สึกอึดอัดไม่สบายตัวที่ได้รับจาก การตรวจปากมดลูกด้วยคลื่นเสียงความถี่สูงทางหน้าท้อง, ทางฝีเย็บและทางช่องคลอด

**การดำเนินการวิจัย** : สตรีตั้งครรภ์ที่มีอายุครรภ์ตั้งแต่ 37 สัปดาห์ขึ้นไป จำนวน 50 ราย ที่สมัครใจเข้าร่วมโครงการ โดยไม่มีข้อบ่งห้าม ได้แก่มีน้ำเดินก่อนกำหนด (preterm premature rupture of membranes), มีประวัติการผ่าตัดปากมดลูก, มีเลือดออกผิดปกติทางช่องคลอดโดยไม่ทราบสาเหตุ หรืออยู่ในระยะเจ็บครรภ์คลอดอย่างแท้จริง (true labor pain) ตรวจปาก– มดลูกด้วยคลื่นเสียงความถี่สูงทางหน้าท้อง (ใช้หัวตรวจแบบ convex ที่มีคลื่นความถี่ 3.5 MHz), ทางฝีเย็บ (ใช้หัวตรวจแบบ convex ที่มีคลื่นความถี่ 3.5 MHz) และทางช่องคลอด (ใช้หัวตรวจทางช่องคลอดที่มีคลื่นความถี่ 7.5 MHz) วัดความยาวของ ปากมดลูก 2 ครั้งในแนวเส้นตรงจาก internal os ไปยัง external os นำค่าเฉลี่ยไปใช้ในการวิเคราะห์ข้อมูล โดยลงผลว่าไม่ สามารถวัดได้เมื่อไม่สามารถมองเห็น internal หรือ external os ได้อย่างชัดเจน หลังจากนั้นให้ผู้เข้าร่วมวิจัยประเมินความรู้สึก ไม่สบายตัวที่ได้จากการตรวจทั้ง 3 วิธี โดยใช้ visual analog scale

**ผลการวิจัย** : สามารถวัดความยาวของปากมดลูกได้ 23 ราย (46%), 49 ราย (98%) และ 50 ราย (100%) จากการตรวจปากมดลูกด้วยคลื่นเสียงความถี่สูงทางหน้าท้อง, ทางฝีเย็บและทางช่องคลอดตามลำดับ โดยไม่พบความแตกต่าง อย่างมีนัยสำคัญทางสถิติของอายุ, น้ำหนักตัว, body–mass index และจำนวนบุตร ระหว่างกลุ่มที่สามารถวัดความยาวปาก– มดลูกได้ กับไม่ได้จากการตรวจปากมดลูกด้วยคลื่นเสียงความถี่สูงทางหน้าท้อง นอกจากนั้นตรวจพบความสอดคล้องอย่างมี นัยสำคัญทางสถิติระหว่างความยาวปากมดลูกที่วัดได้จากการตรวจปากมดลูกด้วยคลื่นเสียงความถี่สูงทางฝีเย็บ กับทางช่องคลอด (r = 0.73, p < 0.01) โดยพบคะแนนความรู้สึกไม่สบายตัวจากการตรวจปากมดลูกด้วยคลื่นเสียงความถี่สูงทางช่องคลอดสูง กว่าการตรวจด้วยวิธีอื่นอย่างมีนัยสำคัญทางสถิติ ในขณะที่ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติระหว่างคะแนนความ รู้สึกไม่สบายตัวจากการตรวจปากมดลูกด้วยคลื่นเสียงความถี่สูงทางหน้าท้องและทางฝีเย็บ

**บทสรุป** : การตรวจปากมดลูกด้วยคลื่นเสียงความถี่สูงทางฝีเย็บให้ภาพปากมดลูกที่มีคุณภาพดี ในขณะที่มีความ รู้สึกไม่สบายตัวจากการตรวจเพียงเล็กน้อย

**คำสำคัญ** :  ความยาวปากมดลูก, คลื่นเสียงความถี่สูง, คลื่นเสียงความถี่สูงทางฝีเย็บ

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