Correlation between Transperineal and Transvaginal Sonography in Cervical Length Measurement among Normal Thai Pregnant Women at 16 to 24 Weeks of Gestation

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Background: *Currently, cervical length is generally measured by transvaginal sonography (TVS) to predict preterm labor. Transperineal sonography (TPS) has been proposed as an alternative modality to TVS.*
Objective: *To compare cervical length measurements and pain scores of TPS and TVS in normal Thai pregnant women*
Material and Method: *A total of 40 normal Thai pregnant singleton women were enrolled at the antenatal clinic, Rajavithi Hospital between 1st December 2014 and 28th February 2015 at 16 to 24 weeks of gestation. Patients were excluded if they had history of and proved rupture of membranes, body mass index (BMI) >30 kg/m^2, antepartum hemorrhage, or mass at perineum. The TPS and TVS techniques for cervical length measurement were performed in all cases by a single researcher (RK). Visual analog scale (VAS) score was used to assess the pain score (total = 10).*
Results: *Mean cervical lengths measured by TVS were slightly greater than those found using TPS (37.80 mm and 35.73 mm, respectively). The Pearson's correlation coefficient between the two methods was 0.746, p<0.01. Mean pain scores determined by VAS score in TPS and TVS were 0.15 and 0.03, respectively (p = 0.02). The number of people whose VAS score was zero was similar with both methods (87.2% and 71.8%, respectively) (p = 0.095).*
Conclusion: *TPS could be used as an alternative method of TVS to assess CL in normal Thai pregnant women at 16 to 24 weeks of gestation because of its good correlation coefficient and lower pain levels.*

Keywords: *Cervical length, Transperineal sonography, Transvaginal sonography*

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Nowadays, cervical length (CL) is used as a predictor of preterm labor, a persistent obstetric problem, because cervical shortening can be found in most incidences of preterm labor[1,2]. Transvaginal sonography (TVS), the standard technique for cervical length measurement, is not accessible to most hospitals, while transabdominal probes are generally available in every ultrasound machine, and transperineal sonography (TPS) for CL measurement can be performed with these probes. Most previous studies[3-10], with the exception of one[11], have reported similar accuracy rates using the transperineal sonographic technique for cervical length measurement compared with those of transvaginal measurements. The TVS technique should be used in preference to TPS, as the latter results in increased embarassment as well as pain because the probe is inserted into the vagina. Different results regarding discomfort scores were reported in two studies.

The present study was therefore designed to compare the cervical lengths and pain scores arrived at using the TPS and TVS techniques in normal Thai pregnant women in Rajavithi Hospital at 16 to 24 weeks of gestation.

Material and Method

This prospective cross-sectional study was conducted at the Antenatal Clinic of Rajavithi Hospital between 1st December 2014 and 28th February 2015. The study was approved by the Hospital's ethics committee (No. 120/2557) and written informed consent was obtained from all participants after they had

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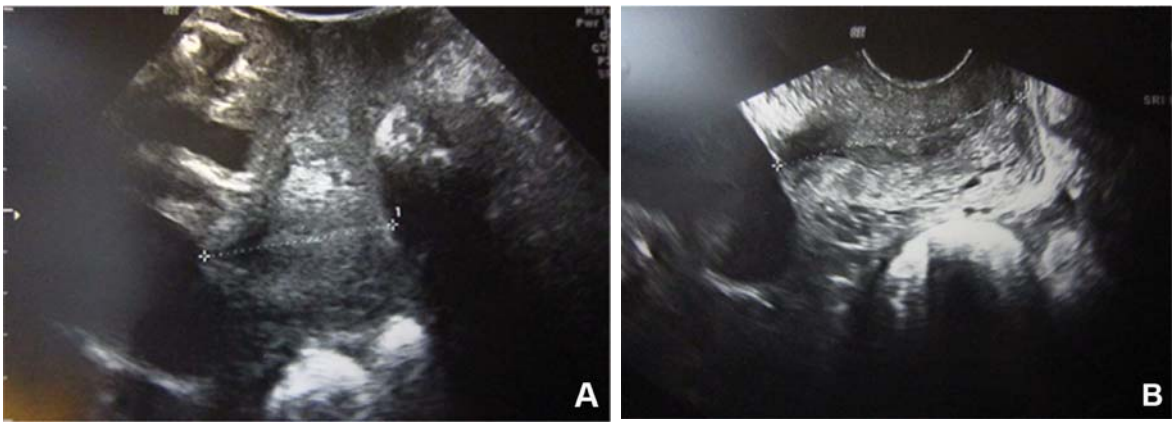

Fig. 1 A) Transperineal cervical length measurement from internal os to external os. B) Transvaginal cervical length measurement from internal os to external os.

Fig. 2 Transvaginal measurement for curved cervix.

received counselling.

Normal Thai pregnant women were included if they were singleton and at 16 to 24 weeks of gestation. Patients with history and proved rupture of membranes, body mass index (BMI) >30 kg/m^2, antepartum hemorrhage, or mass at perineum were excluded.

All sonograms were obtained by a single operator (RK). Transperineal sonography and transvaginal sonography were consecutively performed by a Voluson 730 expert. The mothers were asked to empty their bladders and were laid in the dorsal lithotomy position. Their hips were elevated 7 inches above the scanning table, and a cushion was placed under their buttocks. The transducer probe was covered with coupling gel, after which a glove was placed cover the transducer and finally, coupling gel was placed over the glove. A transabdominal probe (2.5 to 5 MHz) was placed sagitally against the labia majora or perineum and rotated until the cervical canal was visualized using the TPS method. The cervical length was measured by calipers at the internal and external os along the canal of the cervix (Fig. 1A). Transvaginal sonography began with the endovaginal probe (5 to 7 MHz) being gently inserted into the vagina to avoid cervical compression. The transducer was withdrawn a small distance until the full length of the cervix was visualised (Fig. 1B). In cases of curved cervix whose distance drawn perpendicular from the apex of curved cervix to the straight line between internal os and external os was more than 5 mm, CL was calculated by the linear distance between the internal os and the apex of the curved cervix and then added to the linear distance between the apex of the curved cervix to the external os (Fig. 2). Three examinations were performed using each method and the shortest cervical length of each method was used for analysis. The examiner was blinded to measurements on the screen during measurement.

Sample size estimation was calculated using the following formula[12]

$$n = \frac{(Z_{\alpha/2} + Z_g)^2}{C^2} + 3$$

$C = 0.5 \times \ln[(1+r)/(1-r)]$, n = Number of sample size, $Z_{\alpha/2}$ = Standard value from Table Z at confidence interval = 1.96, Z_a = Standard value from Table Z at power of test = 1.645.

Type I error (α), Type II error (β), r = Pearson's correlation coefficient of CL between TPS and TVS. It was defined as statistically significant when $\geq$0.6.

The required sample size was n = 31 cases, and 20% was added to the calculated number, leaving the total subjects required at 38 cases.

Statistical analysis

All data were collected and analyzed using program SPSS/PC version 17.0 (SPSS, Chicago IL). The descriptive data were analyzed using arithmetic mean, standard deviation, median with range, and percentiles as appropriate.

For inferential statistics, Pearson's correlation coefficient was used to determine the correlation in CL between the TPS and TVS methods. A Bland-Altman plot was used to evaluate differences in CL calculated using the two methods. The level of statistical significance was set at $p<0.05$. Chi-square test was used for pain scores measured by VAS ranging from 0 to 10.

Results

A total of 40 pregnant women were enrolled in the study, and demographic characteristics are shown in Table 1. Mean gestational age at examination was 20.26±2.70 weeks.

Table 2 shows the results of CL measured by the TPS and TVS methods. Mean CL examined by TPS was slightly less than that measured by TVS (35.70±7.19 vs. 37.80±7.40 mm, respectively). A difference in CL of ≤5 mm difference measured by the two methods was found in 28 cases (72.0%). The correlation coefficient of cervical length measured by TPS and TVS is shown in Fig. 3. Significant and strong correlations were demonstrated with Pearson correlation coefficient = 0.746; $p<0.001$ (Fig. 4).

The number of people with zero VAS score was similar for the TPS and TVS methods (87.2% and 71.8%, respectively) ($p = 0.095$) (Fig. 4); however, the mean pain score of the TVS method was significantly higher than that found using the TPS method (0.63 and 0.15, respectively) ($p = 0.02$).

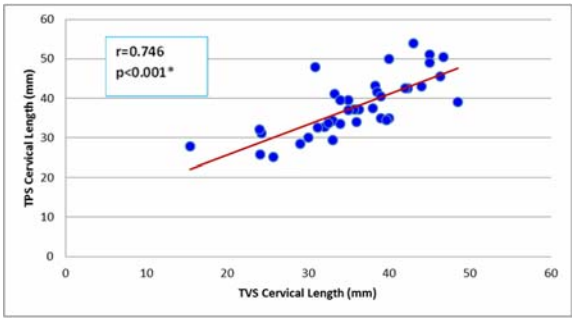

Fig. 3 Correlation coefficient of cervical length measured by transvaginal and transperineal sonogram.

Table 1. Characteristics of the cases (n = 40)

	Mean	SD	Median	Minimum	Maximum	Percentiles	
						10	90
Body weight (kg)	57.02	7.44	57.0	43.0	80.0	48.0	66.4
Height (cm)	155.43	5.00	155.0	146.0	165.0	148.0	161.9
Body mass index (kg/m^2)	23.60	2.83	23.9	18.1	29.6	20.3	27.9
Gestational age at examination (weeks)	20.26	2.70	20	16	24	17	23

Table 2. Cervical length measured by transperineal and transvaginal sonography

	N	Mean	SD	Median	Minimum	Maximum	Percentiles	
							10	90
TPS CL (mm)	40	35.73	7.19	36.0	15.4	48.5	24.2	45.0
TVS CL (mm)	40	37.80	7.4	37.2	25.1	54.0	28.5	50.0

TPS CL = Transperineal cervical length; TVS CL = Transvaginal cervical length

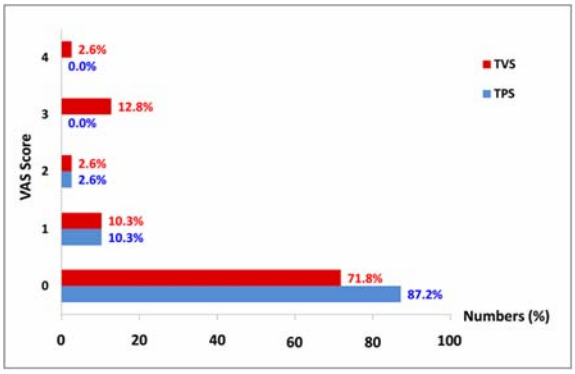

Fig. 4 Visual analog score scale of transvaginal and transperineal sonography.

Discussion

Most previous studies have reported significant good correlation coefficients between the TPS and TVS methods of cervical length measurement in many different situations such as where there is cervical insufficiency, when gestational age has not been identified (GA) (10 to 34), (16 to 24), (14 to 34) and ≥37 week, with different numbers of examiners (single or multiple), and with varying inclusion and exclusion criteria[3-10]. The present study also revealed a similarly significant good correlation coefficient between the TPS and TVS methods[3-10]. Cervical lengths measured by TVS were greater than those measured by TPS, and this is similar to the findings of previous studies[3,5]. Direct pressure of the probe on the cervix in TVS was postulated to be the cause of greater CL by TVS. Only one paper[11] has reported a poor correlation coefficient between the TVS and TPS methods, concluding that TPS should not be used instead of TVS for assessment of CL in the midtrimester. Some unmeasured cases with either TPS or TVS could be proposed as one of the causes of this poor correlation. In the present study, both methods were used in all cases and a single operator performed all the examinations. Even though the same operator performed TPS and then TVS, the examiners carrying out TVS were blinded to the TPS results, so examiner bias should have been minimized. Only two previous reports[9,10] have compared levels of pain, discomfort and embarrassment in TPS and TVS. Cicero et al[10] noted that a high percentage of cases answered "no or mild discomfort" when experiencing the TPS and TVS methods (95% and 83% respectively, $p = 0.06$), and the mean score of the TPS method was significantly lower than TVS (1.1 and 2.4, respectively; $p<0.0001$). Ruengrongmorakot et al[9] also reported significantly different discomfort scores between the TPS and TVS methods (0.5 and 1.3, respectively; $p<0.01$). In the present study, there was a large number of cases with zero VAS score in both the TPS and TVS groups (87.2% and 71.8%, respectively; $p = 0.095$) similar to the findings of Cicero's study (95 % and 83% in the TPS and TVS groups respectively; ($p = 0.095$)[10]. The significantly higher mean pain scores in the TVS technique (0.63) compared with the TPS technique (0.15) were also similar to those in Cicero's study[10] (1.1 and 2.4 in the TPS and TVS groups respectively; $p<0.0001$). This figure was not surprising because an instrument was inserted into the vagina in TVS but not in the TPS method. However, these mean pain scores were all very low because the highest pain score on the scale is 10.

These results suggest that transperineal sonography can be a feasible alternative to transvaginal sonography for cervical length measurement and involves less pain. This technique is an important adjunctive tool in situations where transvaginal sonography should not be performed, such as in cases of premature rupture of membranes, antepartum hemorrhage or when a transvaginal probe is unavailable. It should be recognized that measurement of cervical length tends to be shorter when using the transperineal perspective than when transvaginal sonography is performed.

Conclusion

TPS could be used as an alternative method to TVS to assess CL in normal Thai pregnant women at 16-24 weeks of gestation because of its good correlation coefficient and lower pain score.

What is already known on this topic?

Most previous studies, with the exception of one, have reported a good correlation coefficient using the transperineal sonographic technique for cervical length measurement compared with that of transvaginal measurement.

What this study adds?

Transperineal sonography had a good correlation coefficient for cervical length measurement and produced significantly lower pain score than that of the transvaginal technique.

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Potential conflicts of interest

None.

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