

# ULTRASOUND ASSESSMENT OF CERVICAL LENGTH IN PREGNANCY

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## SUMMARY

Cervical length in high-risk women for preterm birth has to be identified before early second trimester. Sequential evaluations lead to high predictive significance. The mean cervical length at 24 weeks is about 35 mm when measured by transvaginal ultrasound. A short cervix is defined as a cervix that is less than 25 mm and funneling, i.e. ballooning of the membranes into a dilated internal os, but with a closed external os. Factors such as short cervical length, uterine anomaly, previous cervical surgery, multiple gestation and positive fetal fibronectin results are associated with preterm delivery. Serial transvaginal ultrasound examinations during the early second trimester would provide longitudinal changes in the cervical length. The use of 17 $\alpha$ -hydroxyprogesterone caproate and cerclage has shown to be beneficial in preventing preterm delivery. When combined with other predictors such as occiput position, parity, maternal age and body mass index, cervical length is a useful parameter for predicting the feasibility of labor induction and successful delivery. [*Taiwan J Obstet Gynecol* 2008;47(3):291–295]

**Key Words:** cervical length, pregnancy, ultrasound

## Introduction

Cervical assessment in pregnancy has been evaluated extensively in the past decade [1–4]. The relationship between cervical length and obstetric outcome has been evaluated by measuring the cervical length of different patient groups using different methodologies. Measurement of cervical length could be applied not only in the early trimesters for the prevention of preterm birth, but also in the late trimesters for the prediction of the success in labor induction [5]. When a pregnant woman is at high risk for preterm birth with risk factors such as a history of preterm delivery, preterm contraction, vaginal bleeding, vaginal infection, previous cervical surgery or congenital abnormality of the reproductive tract, the uterine cervix has to be carefully examined. Transvaginal ultrasound in combination with physical examination is essential for evaluating the high-risk woman. The following will offer recent evidence and opinion

concerning measurement of cervical length in the management of high-risk pregnancy for preterm delivery.

## Application of Transvaginal Ultrasound in Pregnancy

The importance of transvaginal ultrasound in measuring cervical length in pregnancy was applied and published in 1999 [6]. Transvaginal ultrasound measures the distance between the internal os and external os (Figure 1). The mean cervical length at 24 weeks is about 35 mm. A short cervix is defined as a cervix that is less than 25 mm and funneling, i.e. ballooning of the membranes into a dilated internal os, but with a closed external os [2] (Figure 2). Women with progressively shorter cervixes experience increased rates of preterm birth.

## Cervical Length and Uterine Anomalies

Pregnancies of women with uterine anomalies have higher rates of abortion and preterm deliveries, resulting in lower live birth rates. These pregnancies should be considered as one of the identified factors in high-risk obstetric patients. Recent studies on various sample



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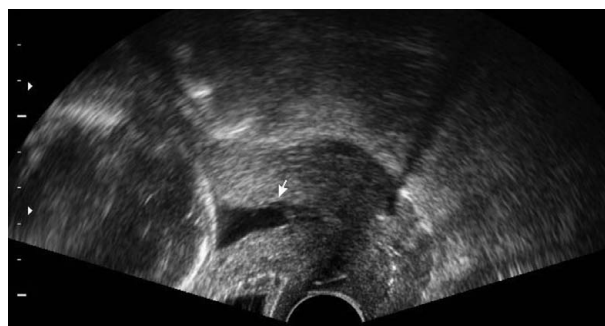
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**Figure 1.** Transvaginal ultrasound revealing the distance between the internal os and external os of normal cervix.



**Figure 2.** A short cervical length of <25 mm with funneling after cerclage (arrow).

sizes mostly with cervical lengths measured between 14 and 24 weeks of gestation showed that women with uterine anomalies and short cervices of <25 mm had 50% more spontaneous preterm births than those with uterine anomalies but normal cervical lengths [7,8]. Subtypes of uterine anomalies, including bicornuate, septate, didelphys and unicornuate uteri, were reported, with unicornuate uterus being associated with the highest rate of cervical shortening and preterm delivery [7,8].

### Cervical Length and Prior Conservative Cervical Surgery

A history of more than one induced first-trimester abortion not only increases the risk of endometrial injury, but also has an impact on subsequent preterm delivery or abnormal placentation. Women with multiple prior induced abortions and short cervices at 14–24 weeks have a 3.3-fold greater chance of spontaneous preterm births than those with cervical lengths of  $\geq 25$  mm [9].

With the advent of effective screening programs, conservative methods are used to treat cervical intraepithelial neoplasia and microinvasive cervical cancers in

reproductive-age women. Recent systematic reviews and meta-analyses have raised high concerns on cervical surgery and preterm birth [10–14]. There are several hypotheses by which cervical excision procedures might increase the risk of preterm deliveries. The proposed hypotheses include decreased mechanical support due to removal of stromal tissue, shortened cervical length, antimicrobial defense impairment after removal of cervical glands, and cervicovaginal bacterial flora alteration. For women who had prior cold knife conization or loop electrosurgical excision procedure, a study reported that there was a significant increase in subsequent preterm births or preterm premature rupture of the membranes (PPROM) [12]. However, data on the obstetric outcome of performing a cervical surgery during pregnancy are limited [15,16].

### Cervical Length in Multiple Pregnancies

The median gestational age of delivery is 36 weeks for twins, 33 weeks for triplets, and 29 weeks for quadruplets. Multiple gestations result in greater uterine distension, which can initiate labor and promote earlier cervical changes compared with singleton pregnancies. Approximately 10% of preterm deliveries are from twin gestations. The rate of spontaneous preterm delivery was 1.5% for dichorionic and 9.1% for monochorionic twins before 28 weeks [17]. Studies on both cervical length and funneling at 22 weeks' gestation are able to predict preterm birth in dichorionic twin pregnancies (excluding monochorionic twin pregnancies). A cervical length of >30 mm for twins indicates a low risk of preterm delivery. However, a cervical length of <25 mm at 18 weeks or a shortening of cervical length at >2.5 mm per week between 18 and 28 weeks is associated with a risk of preterm delivery for twins [18–20]. On the other hand, monochorionic twin pregnancies need tailored obstetric management.

Although studies on triplet pregnancy were based on small number of cases, a cervical length of <25 mm at 14–20 weeks has been associated with preterm delivery (delivery before 32 weeks) of triplets and adverse perinatal outcome [21–26]. Early evaluation schedule is thus recommended for triplets in the first trimester.

### Cervical Length and Biochemical Markers for Predicting Preterm Labor

The criteria to document a preterm labor include: (1) four contractions in 20 minutes or eight in 60 minutes, plus progressive change in the cervix; (2) cervical

dilatation of more than 1 cm; and (3) cervical effacement of 80% or more [27]. Cervical length assessed by transvaginal ultrasound at 16–18 weeks, augmented by serial evaluations, is a predictor of spontaneous birth before 35 weeks in high-risk women [1,28]. For the low-risk pregnancy, cervical ultrasound and fetal fibronectin have low sensitivity for preterm birth before 35 weeks' gestation [29].

While preterm births between 28 to 35 weeks' gestation do not always result in significant neonatal complications, very early preterm deliveries before 28 weeks' gestation carry a risk of severe newborn morbidities. Early identification of high-risk women could be as early as 16–18 weeks' gestation by using cervical length. Sequential evaluations would result in higher prediction [1,3,27,28,30].

The most commonly available commercial kit to detect fetal glycoprotein in cervicovaginal secretion is that for fibronectin. A positive result for cervical or vaginal fetal fibronectin is one with a value exceeding 50 ng/mL by an enzyme-linked immunosorbent assay. It is a powerful predictor of subsequent preterm birth when a positive test is indicated as early as 8–22 weeks [31]. However, cervical manipulation and infection can also stimulate fetal fibronectin release.

Studies on patients at high risk for preterm delivery showed that a transvaginal cervical length of <10 mm, cervical funneling of >75% and a positive fetal fibronectin screening were most predictive of preterm delivery caused by PPROM [32,33]. Progression of cervical shortening and preterm labor symptoms were predictors of the risk, and tocolytic agents would be indicated.

### Cerclage for Incompetence Due to Short Cervical Length

Cervical incompetence is traditionally described as a history of painless dilatation of the cervix, with prolapse and ballooning of membranes into the vagina, followed by expulsion of an immature fetus [34]. It is due to a physical defect in the cervical tissue, either congenital or acquired, and is a cause of recurrent second-trimester or early third-trimester pregnancy loss [35].

Shortened cervical length in high-risk women with previous abortion or cervical surgical intervention has been consistently associated with spontaneous preterm birth. A cervical length of <25 mm or funneling of the internal os of >25% measured as early as 14–16 weeks or by 24 weeks of gestation is a significant predictor. Cervical cerclage alone in these high-risk women showed marginal benefit in the prevention of preterm delivery [36]. The use of 17 $\alpha$ -hydroxyprogesterone caproate and

cerclage in a study had benefits in preventing preterm delivery [4,36]. But another study revealed that the combination of cerclage and other tocolytics, such as indomethacin, was not associated with a decrease in pregnancy loss [37]. Prophylactic or planned cerclage procedures based on previous history or on ultrasound examination are usually performed around 14 weeks [35]. However, the routine use of ultrasound to diagnose cervical incompetence in low-risk pregnancies is not recommended. The efficacy of cerclage in low-risk women with short cervixes is inconclusive [38]. Emergent or therapeutic cerclage tends to be performed after 18 weeks and poses technical challenges. The obstetric outcome of preventing preterm birth by emergent cerclage remains uncertain.

### Cervical Length and Induction of Labor

Preinduction ultrasonographic measurement of cervical length is a useful predictor of successful delivery. Studies found that prediction of the likelihood of cesarean section was provided by cervical length, occiput position, parity, maternal age and body mass index [39,40]. In addition, a mid-trimester cervical length is an independent predictor of the risk of cesarean section at term in primiparous women [5]. When comparing transvaginal ultrasound for cervical length with digital examination for Bishop's score, both are useful predictors of labor induction with the former being better tolerated [41].

### Three-dimensional Assessment for Cervical Length

Some small case studies tried to report the optimal cut-off point of the cervical volume at mid-trimester [42–45]. The technically more complex three-dimensional imaging measures the cervical length, width and anteroposterior diameters, but does not add any benefit when compared with the conventional cervical length measurement for prediction of preterm delivery [42–45]. Owing to anatomic factors, three-dimensional cervical volumetry ultrasound assessment did not provide additional information, even in high-order multiple gestation, according to a study [46].

### Conclusion

Measurement of cervical length during pregnancy is fundamental and handy for obstetricians. The examination is tolerable to pregnant women. Use of ultrasonographic

cervical measurements increases the ability to predict spontaneous birth before 28 weeks in high-risk women, such as those with a history of preterm birth plus a short cervix. Practically, serial transvaginal ultrasound examinations in the early second trimester from 14–16 weeks to 24–27 weeks would provide longitudinal changes in the cervical length and a better understanding of very early preterm birth before 28 weeks. A positive fetal fibronectin result, PPRM, and a short cervix are highly associated with one another. Cervical length should also be taken as one of the parameters when induction of labor is considered.

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