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THE VALUE OF CERVICAL LENGTH TO PREDICT PRETERM BIRTH

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ABSTRACT

The ultrasound-based measurement ın the 1980s was developed to identify women at increased risk of preterm birth. The risk of preterm birth was inversely correlated to the length of the cervix as measured by ultrasound. This observation has been confirmed in multiple studies using different techniques; however, the most widely accepted and used technique is transvaginal ultrasound.34,47–57 A number of interventions based on this observation have been studied in randomized trials. A recent meta-analysis58 has looked at its efficacy in preventing preterm birth. Since the publication of the 2001 SOGC guideline, 36 there have been numerous studies on imaging, natural history, and use of transvaginal ultrasound in common clinical scenarios, as well as a number of randomized trials looking at interventions for a short cervix. This updated guideline provides a comprehensive review of studies of shortened cervical length diagnosed on transvaginal ultrasound and is broader in scope than the 2001 guideline.

KEYWORDS: Ultrasound - Cervical length - population - preterm - Transvaginal -Preterm birth.

INTRODUCTION

Cervical length in the general obstetrical population is relatively stable over the first 2 trimesters. The natural history of cervical length change may be useful in identifying women at increased risk of spontaneous preterm birth.

Because there may be different patterns or a delay in cervical length shortening, repeat assessment of cervical length may be useful. (II-2).[2] There is no consensus on the optimal timing or frequency of serial evaluations of cervical length. If repeat measurements are performed, they should be done at suitable intervals to minimize the likelihood of observation error. (II-2).[3]

Transvaginal sonography can be used to assess the risk of preterm birth in women with a history of spontaneous preterm birth and to differentiate those at higher and lower risk of preterm delivery. The gestational age of a prior preterm birth affects the cervical length in a future pregnancy. (II–2).[4]

Cervical length measurement can be used to identify increased risk of preterm birth in asymptomatic women at 24 weeks' gestation who are at increased risk of preterm birth (e.g., those who have a history of prior spontaneous preterm birth, previous excisional treatment for cervical dysplasia, uterine anomaly, or prior multiple dilatation and evacuation procedures beyond 13 weeks' gestation) and who have a short cervical length.

This information may help with empiric management of these women, including reduction of activity level, work, or travel, relocation, increased surveillance, and administration of corticosteroids. (III).[6]

Transvaginal ultrasound appears to be safe in preterm premature rupture of membranes, but its clinical predictive value is uncertain in this context. (II-2).[7]

It is unclear whether ultrasonographic cervical length assessment has significant advantages over clinical examination alone after elective or emergency cervical cerclage placement, although some signs, such as funneling to the stitch, are associated with a high risk of preterm premature rupture of membranes. There is no consensus on the frequency or timing of ultrasonographic cervical length assessment post cerclage. (II-2).[8] It is unclear whether a policy of cervical length surveillance is equivalent to clinical assessment of the need for elective cerclage in those at risk of preterm delivery.(I).[9]

Ultrasonographic cervical length assessment and fetal fibronectin appear to be similar in predictive ability, and the combination of both in a high-risk population may be of value. However, further research is needed in this area. (II-2) Recommendations 1. Transabdominal ultrasonography should not be used for cervical length assessment to predict preterm birth. (II-2D) 2.

Transvaginal ultrasonography is the preferred route for cervical assessment to identify women at increased risk of spontaneous preterm birth and may be offered to women at increased risk of preterm birth. (II-2B) 3.

Transperineal ultrasonography may be offered to women at increased risk of preterm birth if transvaginal ultrasonography is either unacceptable or unavailable. (II-2B) 4. Because of poor positive predictive values and sensitivities and lack of proven effective interventions, routine transvaginal cervical length assessment is not recommended in women at low risk. (II-2E) 5.

In women presenting with suspected preterm labor, transvaginal sonographic assessment of cervical length may be used to help in determining who is at high risk of preterm delivery and may be helpful in preventing unnecessary intervention.

It is unclear whether this information results in a reduced risk of preterm birth. (II-2B) 6. In asymptomatic women with a history of spontaneous preterm birth and an ultrasonographically diagnosed short cervical length.

Objectives

(1) the use of ultrasonographic-derived cervical length measurement in predicting preterm birth.

(2) interventions associated with a short cervical length. Outcomes: Reduction in rates of prematurity and/or better identification of those at risk, as well as possible prevention of unnecessary interventions.

MATERIALS AND METHODS

Preterm birth is the leading cause of perinatal morbidity and mortality.1–5 Despite advances in perinatal care, the incidence of preterm birth continues to rise, primarily because of the increased multiple pregnancies resulting from assisted reproduction.6–9 Tocolytics prolong pregnancy minimally once preterm labor has begun, and they can be associated with significant undesirable maternal, fetal, and neonatal consequences.10–19 In order to address the prematurity problem, it is important to identify those at increased risk.

The following are risk factors for spontaneous preterm birth

Reproductive history (previous spontaneous preterm birth and use of assisted reproductive technologies).[8,20-22]

• Antepartum bleeding, rupture of membranes, cervical/uterine factors (cervical insufficiency, uterine anomalies,[22] fibroids, and excisional cervical treatment for cervical intraepithelial neoplasia).[23-250]

• Fetal/intrauterine factors (multifetal gestation, fetal anomaly, and polyhydramnios)

• Infection (chorioamnionitis, bacteria, periodontal disease,26 current bacterial vaginosis with a prior preterm birth[27])

• Demographic factors (low socioeconomic status, single marital status, low level of education, First Nations ethnicity, or maternal age 35 years)

• Lifestyle issues (cigarette smoking, illicit drug use, stress, physical abuse[28])

• Inadequate prenatal care, low pre-pregnancy weight and poor weight gain in pregnancy.[29] However, many women who deliver preterm do not have any known risk factors.[8,22]

Research has focused on combined risk scoring systems that use multiple serum markers, ultrasound, and maternal demographic factors, but these have not been fully validated in large scale studies.[30-42] Other screening strategies that have been suggested include measuring biochemical markers such as fetal fibronectin and screening for infections.[27,43-46]

In the 1980s, an objective, ultrasound-based measurement was developed to identify women at increased risk of preterm birth. The risk of preterm birth was inversely correlated to the length of the cervix as measured by ultrasound.

This observation has been confirmed in multiple studies using different techniques; however, the most widely accepted and used technique is transvaginal ultrasound.[34,47-57] A number of interventions based on this observation have been studied in randomized trials.

A recent meta-analysis58 has looked at its efficacy in preventing preterm birth. Since the publication of the 2001 SOGC guideline,36 there have been numerous studies on imaging, natural history, and use of transvaginal ultrasound in common clinical scenarios, as well as a number of randomized trials looking at interventions for a short cervix.

This updated guideline provides a comprehensive review of studies of shortened cervical length diagnosed on transvaginal ultrasound and is broader in scope than the 2001 guideline, as shown ın table (1) below.

Table 1. Key to evidence statements and grading of recommendations, using the ranking of the Canadian Task Force on Preventive Health Care

Quality of evidence assessment*	Classification of recommendations†
I: Evidence obtained from at least one properly randomized controlled trial	A. There is good evidence to recommend the clinical preventive action
II-1: Evidence from well-designed controlled trials without randomization	B. There is fair evidence to recommend the clinical preventive action
II-2: Evidence from well–designed cohort (prospective or retrospective) or case–control studies, preferably from more than one centre or research group	C. The existing evidence is conflicting and does not allow to make a recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making
II-3: Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category	D. There is fair evidence to recommend against the clinical preventive action
	E. There is good evidence to recommend against the clinical preventive action
III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees	L. There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision-making

* The quality of evidence reported in these guidelines has been adapted from The Evaluation of Evidence criteria described in the Canadian Task Force on Preventive Health Care.[141]

† Recommendations included in these guidelines have been adapted from the Classification of Recommendations criteria described in the The Canadian Task Force on Preventive Health Care.[141]

Digital assessment of the cervix has been commonly used to diagnose premature labor or to evaluate women perceived to be at increased risk of preterm labor. Digital assessment of cervical length is subjective, varies between Table 1. Key to evidence statements and grading of recommendations, using the ranking of the Canadian Task Force on Preventive Health Care Quality of evidence assessment* Classification of recommendations† I: Evidence obtained from at least one properly randomized controlled trial A.

There is good evidence to recommend the clinical preventive action II-1: Evidence from well-designed controlled trials without randomization B. There is fair evidence to recommend the clinical preventive action II-2: Evidence from well–designed cohort (prospective or retrospective) or case-control studies, preferably from more than one center or research group C.

The existing evidence is conflicting and does not allow to make a recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making II-3: Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category D.

There is fair evidence to recommend against the clinical preventive action E. There is good evidence to recommend against the clinical preventive action III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees L.

There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision-making * The quality of evidence reported in these guidelines has been adapted from The Evaluation of Evidence criteria described in the Canadian Task Force on Preventive Health Care. 141 † Recommendations included in these guidelines have been adapted from the Classification of Recommendations criteria described in The Canadian Task Force on Preventive Health Care. 141 MAY JOGC MAI 2011 l 489 Ultrasonographic Cervical Length Assessment in Predicting Preterm Birth in Singleton Pregnancies examiners, and underestimates true anatomic length. In one study, digital examinations before hysterectomy underestimated cervical length by approximately 14 mm, whereas ultrasonography measured length accurately.[59] Investigations using transvaginal ultrasound measurement as the standard confirmed that digital examination underestimates cervical length.[57,60]

This underestimation may result from an inability to assess the cervix length digitally beyond the vaginal fornices unless there is 2 cm or more of dilatation and the entire intracervical canal is examined.

The majority of studies have found that ultrasound assessment of cervical length is superior to clinical examination for the prediction of preterm birth.[61–64] Therefore, ultrasound assessment of cervical length is more reliable and more clinically predictive of preterm birth than manual examination of the cervix.

Comparıson of Transvagınal, Transabdomınal, and Transperıneal Ultrasonographıc Cervıcal Length Assessment

Ultrasound assessment of the cervix was initially performed transabdominally, but specific disadvantages led to a preference for transvaginal ultrasound assessment. Both TP and TV cervical assessments have been studied, with most studies evaluating TV assessment.[65,66] The patient's bladder must be full for transabdominal ultrasonography to assess the cervix adequately, but this may spuriously lengthen the cervix by opposing the anterior and posterior lower uterine segments[65] and concealing cervical shortening or funneling.

In contrast, TV ultrasound is performed with the bladder empty.[66] Transabdominal ultrasound is significantly less likely than the other 2 methods to provide adequate imaging and measurements.[67]

Visualization of the cervix by transabdominal ultrasonography is hampered significantly by maternal obesity, shadowing from fetal parts, and the need for lower frequency transducers.

Normal Cervıcal Length: Cervical length is normally distributed and remains relatively constant in pregnancy until the third trimester.[73-75] If there is any statistically significant reduction in length, it is not clinically significant.

The natural history of cervical shortening in women who will deliver preterm may be used to determine when serial measurements should be performed.

These studies may make it possible to time reassessment and perhaps stratify follow-up according to length of measurement and the desired target threshold for intervention. Studies report thresholds for intervention ranging from 15 mm to 25 mm.[82-87]

Thus depending on the initial cervical length, the chosen threshold for intervention, and knowledge of natural history, it is possible to estimate when the next measurement should be performed. For example, if the measured cervical length is 36 mm and the threshold for intervention is 20 mm, then it is reasonable to wait 2 weeks to reassess cervical length, assuming the greatest velocity of cervical decline (8 mm/week).

Using a mid-range estimate of cervical decline (5 mm/week), it would be reasonable to wait at least 3 weeks between ultrasound assessments. If the initial cervical length is greater than that, the interval between assessments could be longer. As shown ın table (2).

Table 2. Meta-analysis of the use of cervical length measurements (Sotiriadis et al.[106])

Performance based on a 15 mm threshold									
Outcome	Studies	n	Prevalence	Sens	Spec	LR+	LR−	PPV	NPV
< 48 hours	3	1266	7.1	71.1	86.6	5.92	0.35	28.8*	97.5*
< 7 days	6	1781	11.1	59.9	90.5	5.71	0.51	44.03*	94.7*
< 34 wks	4	429	18.18	46.2	93.7	4.31	0.63	62.2*	88.7*
Performance based on a 20 mm threshold									
Outcome	Studies	n	Prevalence	Sens	Spec	LR+	LR−	PPV	NPV
< 7 days	4	1263	9.3	75.4	79.6	3.74	0.33	27.6*	96.9*
< 34 wks	2	385	20.5	49.4	93.1	n/a	n/a	65*	88.5*
Performance based on a 25 mm threshold									
Outcome	Studies	n	Prevalence	Sens	Spec	LR+	LR−	PPV	NPV
< 7 days	4	856	9.7	78.3	70.8	2.81	0.36	22.3*	96.8*
< 34 wks	5	735	11.40	64.3	68.4	n/a	n/a	20.8*	93.7*

* Extrapolations based on unweighted data presented for each horizontal category

As abvıous of infection and should be postponed until labor is established. Several cohort studies have shown that the cervical length measured by TV predicts latency to delivery in preterm premature rupture of membranes.109,110 In a much smaller study, cervical length measurements by TP ultrasound did not correlate with latency duration to delivery.111

Transvaginal cervical length measurement in a randomized trial was not found to increase the risk of infection in patients with preterm premature rupture of membranes. This study did not find that cervical length had predictive value for latency.

CONCLUSION

Ultrasonographic cervical measurement is a safe and effective technique to predict increased risk of preterm delivery in selected women. The transvaginal route appears to be the most well studied and is acceptable to women; however, the transperineal route can also be used if the patient declines the transvaginal route. It can also be used to prevent unnecessary interventions in women at increased risk of preterm delivery if the result is reassuring. In contrast, routine prenatal transvaginal ultrasound screening of cervical length in low-risk populations is not supported by available evidence. Evidence from randomized trials supports the recommendation of cerclage in patients with a prior preterm birth and a short cervix. The thresholds proposed vary from 15 mm to 28 mm. The use of progesterone in patients with a short cervix appears promising, but consensus recommendation awaits further evidence and/or analysis. Further evidence is also needed with respect to the utility of measuring fetal fibronectin in conjunction with measurements of cervical length.

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