REVIEW ARTICLE

Cervical Length Measurement in Obstetrics: From Academic Luxury to Clinical Practice

Badreldeen Ahmed, Zohra Hasnani

ABSTRACT

Preterm birth is the main cause of perinatal mortality and morbidity and can be very costly to the healthcare system. Although improvements in neonatal care have led to higher survival of very premature infants, there is a need for the development of a sensitive method with which to identify women at high risk of preterm delivery and find an effective strategy for the prevention of preterm labor.[1] Considering the increased incidence of preterm birth, it has become more important now to be able to early diagnose this problem. The measurement of cervical length to predict the risk of preterm birth can be extremely useful in diagnosing this condition. The use of transvaginal ultrasound in measuring cervical length is safe, reliable and well accepted by women.[2] The use of vaginal progesterone has shown to be effective in the prevention of preterm delivery in women with short cervix. Tocolytics are used to delay labor for a minimum of 24 to 48 hours[3] for up to 1 week but they have not shown to improve neonatal outcomes and most have undesirable side effects. Steroids can assist with fetal lung maturity when the diagnosis of preterm labor is made,[3] they can be used unnecessarily when preterm labor is misdiagnosed. The measurement of cervical length can also be helpful in patients with preterm premature rupture of membrane and in patients with the presence of amniotic fluid (AF) sluge.[4] Therefore, performing cervical length measurements in all pregnant women and use it as a screening tool at around 20 weeks of pregnancy to identify patients at high risk of preterm labor can assist with true diagnosis. There is a great expectation from cervical assessment and subsequent addition of progesterone to reduce preterm birth and have better neonatal outcomes.

The aim of this review is to bring forward evidence that highlights the importance of performing cervical length measurement in midpregnancy in all pregnant women to predict the risk of preterm birth.

Medline, PubMed, MD Consult and Science Direct were searched using the terms cervical length measurement, 'preterm delivery', 'amniotic fluid sludge' and 'treatment for preterm birth'.

Keywords: Cervical length measurement, Preterm labor.

INTRODUCTION

Preterm birth is the main cause of perinatal mortality and morbidity and can be very costly to the healthcare system. All births before 37 weeks of gestation are termed as preterm.[1] The rate of prematurity has not decreased over the past 40 years.[5] Incidence of preterm labor in the United States in 1981 was 8%, which increased close to 11% in the year 2000. In 2008, the rate was 12.3%.[6] After North America, the second highest is 10% in Africa. In the Women's Hospital, Doha, Qatar, in the year 2004, out of 13,000 deliveries, 923 had preterm labor (7.09%). In the developed countries, the situation was made worst by the assisted reproductive technology (ART).[5] Two-thirds of prematurity is due to spontaneous birth resulting from premature onset of labor or preterm prelabor rupture of membranes (PPROM), and the rest is because of delivery decisions based on maternal or fetal indications.[1]

Preterm labor is a heterogeneous condition. It is a syndrome which can have many causes. Term and preterm parturition share a common pathway except that they are happening at different gestational ages and their mechanisms are different. Uterine contraction, cervical dilatation and activation of membranes happen in both. However, term parturition occurs due to physiological activation of the components responsible for the changes, whereas in preterm parturition, pathological factors are responsible for the activation of one or more components of the pathway.[7] Although improvements in neonatal care have led to higher survival of very premature infants, there is a need for the development of a sensitive method with which to identify women at high risk of preterm delivery and find an effective strategy for the prevention of preterm labor.[1,8] The best indicator to detect preterm birth is the cervical length.

Considering the increased incidence of preterm birth, it has become more important now to be able to early diagnose this problem. The measurement of cervical length to predict the risk of preterm birth can be extremely useful in diagnosing this condition. Since the 1980s, transvaginal ultrasound (TVU) has been used to measure cervical parameters to identify women at increased risk of preterm birth and in some situations, may lead to interventions that may reduce the rate of preterm birth.[2,6]

Cervical Length

The cervix goes through various stages during labor. A short cervical length is the ultimate common pathway for many conditions responsible for spontaneous preterm birth.[5] In a study by Fonseca et al[9] transvaginal ultrasound scan was performed between 22 and 25 weeks gestation and short cervix of 15 mm or less was found in 1.7% of pregnancies.

Heath et al[10] performed a cervical length measurement in 2567 singleton women attending regular prenatal clinic at 23 weeks gestation and found 2% of women having a cervical length of ≤ 15 mm. Out of this group 86% delivered spontaneously at <28 weeks and 58% delivered at <32 weeks of gestation.[9] Study by Hassan et al[11] screened women at 19 to 24 weeks' gestation and found 2.3% women had a cervical length between 10 to 20 mm.[11] Despite a low incidence of a short cervix, it will be worth doing a cervical length measurement at routine prenatal visit between 20 to 23 weeks of gestation to accurately predict the risk for early preterm delivery.

Cervical length varies in low-risk women with a mean value of 35 to 40 mm from 14 to 30 weeks of gestation. In this group, the positive predictive value for cervical length of 15 to 34 mm ranges from 6 to 44%. Eighty-two percent of these patients with short cervical length at 24 weeks deliver at or after 35 weeks. On the other hand, a positive predictive value of 70% can be obtained in high-risk patients, in those with a previous history of preterm birth when cervical length of <25 mm is measured between 14 and 18 weeks of gestation.[2] Thus, measurement of cervical length can add value in the management of patients with history and risk factors for a preterm birth. Other risk factors for preterm birth include: Previous cervical surgery, cone biopsy, uterine anomaly or prior multiple dilatation and evacuation procedures beyond 13 weeks' gestation.[2]

A longitudinal prospective study was conducted by Souka et al[12] to examine the changes in cervical length from the first to second trimester of pregnancy and the value of first trimester cervical screening when preterm delivery is predicted. They examined 800 singleton pregnancies and performed cervical length measurements by TVU. Mean cervical length shortening between 11 to 14 and 20 to 24 weeks was 2.36 mm. In women with previous cervical surgery and history of previous preterm birth, cervical shortening was increased. They concluded that first trimester cervical length measurement can predict preterm delivery.[12]

The measurement of cervical length can also be helpful in patients with preterm premature rupture of membrane. Mercer et al[13] evaluated 2929 women in 10 centers at 23 to 24 weeks gestation. Patients were evaluated for spontaneous preterm birth caused by preterm premature rupture of membranes at <37 and <35 weeks gestation. In both nulliparous as well as in multiparous women, short cervix (≤ 25mm) was the only risk factor that was consistently associated with preterm birth caused by premature rupture of membranes at <35 and <37 weeks gestation. The other risk factors associated with preterm delivery caused by premature rupture of membrane included previous history of preterm birth and the presence of fetal fibronectin. With the presence of all three risk factors the rate of preterm birth caused by premature rupture of membranes increased significantly.[13]

Medications used when Preterm Labor is Diagnosed

The most common medications being studied in preterm births include tocolytics, steroids and progesterone. Tocolytics are used to delay labor for a minimum of 24 to 48 hours[3] for up to 1 week, but they have not shown to improve neonatal outcomes and most have undesirable side effects. Moreover, they did not show significant reduction in preterm deliveries before 30, 32 or 37 weeks gestation.[5] Steroids, on the other hand, can help promote fetal lung maturity when preterm diagnosis is made.[3] A prospective cohort study of antenatal corticosteroid administration before 34 weeks of gestation showed that there was a higher rate of antenatal corticosteroid administration in women presenting with risk of preterm birth. Seventy-nine percent of women who presented with a risk of preterm birth delivered after 34 weeks of gestation and out of those, 67% received full course of corticosteroids. The authors question the accuracy of selecting women for appropriate antenatal steroid administration by relying only on history and clinical assessment of cervix.[14]

The use of vaginal progesterone has shown to be effective in the prevention of preterm delivery in women with short cervix. A multicenter, randomized, double-blind, placebo-controlled trial was recently completed by Hassan et al[11] to determine the efficacy and safety of micronized vaginal progesterone gel to reduce the risk of preterm birth and associated neonatal complications. They studied asymptomatic singleton pregnancy, with gestation between 19 0/7 and 23 6/7 weeks with TVU detected cervical lengths between 10 and 20 mm. Subjects were randomly assigned to receive vaginal progesterone gel or placebo beginning at 20 to 23 6/7 weeks. A bioadhesive gel with 90 mg of progesterone was used. Rate of preterm birth before 33 weeks of gestation was significantly lower in the vaginal progesterone group when compared with the placebo group (8.9% *vs* 16.1%). The rate of preterm birth before 35 weeks of gestation was 14.5% for vaginal progesterone group *vs* 23.3% for the placebo group and before 28 weeks of gestation was 5.1% for the vaginal progesterone group *vs* 10.3% for the placebo group. The reduction in the rate of preterm birth in women with a prior history of preterm birth between 20 to 35 weeks did not reach statistical significance (15.8% for the vaginal progesterone group *vs* 20.6% for the placebo group). There was a significant reduction in the

rate of infants weight less than 1500 gm in vaginal progesterone group (6.4% *vs* 13.6% for the placebo group), significantly lower frequency of respiratory distress syndrome (RDS) in vaginal progesterone group *vs* placebo (3.0% *vs* 7.6%) and significantly lower rate of any neonatal morbidity or mortality in progesterone group *vs* placebo group (7.7% *vs* 13.5%).[11] The results of this trial strongly suggest a universal screening of women with transvaginal cervical length measurement in the mid trimester to identify patients at risk. It also suggests the use vaginal progesterone gel to reduce the frequency of preterm birth and improve neonatal outcome.[11] Their study did not show a significant effect of the use of progesterone in reducing the rate of preterm birth in women with a prior history of preterm birth.

In another study by Fonseca et al[9] to evaluate the efficacy of vaginal progesterone in women with short cervix, cervical length was measured by transvaginal ultrasonography between 20 and 25 weeks of gestation in 24,620 pregnant women seen for routine prenatal care. Cervical length was 15 mm or less in 413 women (1.7%), and 250 (60.5%) of these 413 women who agreed to participate in the trial were randomly assigned to receive vaginal progesterone (200 mg each night), or placebo from 24 to 34 weeks of gestation. This study included 226 women with singleton and 24 women with twin pregnancies. The main outcome was to see the incidence of spontaneous delivery before 34 weeks of gestation. Spontaneous delivery before 34 weeks of gestation was less frequent in the progesterone group than in the placebo group (19.2% *vs* 34.4%; relative risk, 0.56; 95% confidence interval [CI], 0.36 to 0.86). However, there was no statistically significant reduction in neonatal morbidity (8.1% *vs* 13.8%). There were no serious adverse events associated with the use of progesterone. This study was not sufficiently powered to stratify neonatal morbidity and also included multiple pregnancies, which may have an impact on adverse neonatal outcomes.[9]

Presence of Amniotic Fluid Sludge

The combination of amniotic fluid (AF) sludge and a short cervix is a better predictor of risk for spontaneous preterm delivery at <28 and <32 weeks of gestation than a short cervix alone[4] (Fig. 1). A retrospective case-control study in asymptomatic patients at higher risk for spontaneous delivery was done to determine the clinical significance of the presence of amniotic fluid sludge. It included 281 patients; 66 with amniotic fluid sludge and 215 without amniotic fluid sludge, who underwent transvaginal ultrasound examination between 13 and 29 completed weeks of gestation. They concluded that those patients with AF sludge had a shorter cervical length at ultrasound

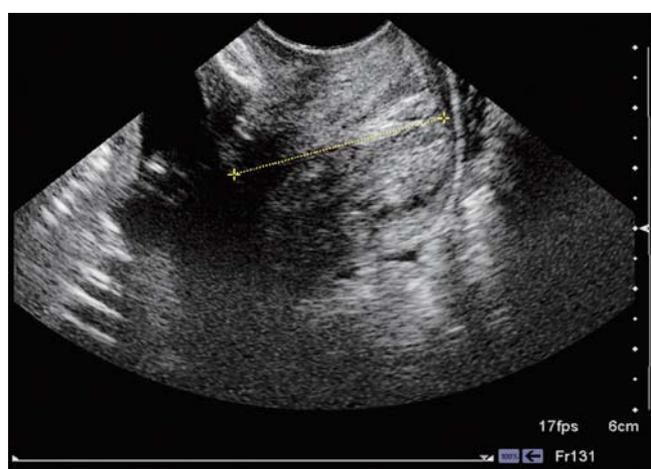**Fig. 1:** Presence of amniotic fluid sludge

Fig. 2: Cervical length measurements

examination and delivered at earlier gestational age when compared with those without AF sludge. Patients with threatened preterm labor, multiple gestation, fetal anomalies, placenta previa or uterine contractions were excluded from this study.[4]

Criteria to Measure Cervical Length

There is a need for proper training of obstetricians to measure the cervical length accurately. A specific criterion should be followed to have a consistent and reproducible finding (Fig. 2). Table 1 aims to describe the criteria to measure the cervical length.

CONCLUSION

Although the incidence of short cervix is small in pregnant women without any risk factors or a history of preterm birth, it will be worth doing cervical length measurements in all pregnant women and use it as a screening tool at around 20 weeks of pregnancy. This is because there is a great expectation from cervical assessment and subsequent

Table 1: Criteria to measure cervical length

Criteria to measure cervical length as follows:
- Empty bladder
- TV transducer 5 MHz
- Probe in anterior fornix
- Identify endocervical canal
- Avoid pressure on cervix
- Magnify the picture (>75% of screen)
- Measure internal to external os
- Three measurements over 3 minutes
- Look for the evidence of funnelling at the internal os

Normal cervical length is 25 mm and above; TV: Transvaginals

addition of progesterone to reduce preterm birth and have better neonatal outcomes. Since, it is a very safe procedure with no increased risk of infection for mother or baby, and it can recognize the risk in its asymptomatic phase, all obstetricians should be encouraged to do routine cervical measurements at 20 weeks. However, there is a need for proper training and established criteria before starting cervical length measurements. Cervical length measurement can also effectively assist in the management of women presenting with preterm contractions as it can discriminate between women not in labor and those who are at risk for preterm delivery. It will also prevent unnecessary administration of tocolytics and steroids and unnecessary interventions like activity restriction. The presence of AF sludge along with a short cervix can also truly predict preterm delivery.

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ABOUT THE AUTHORS

Badreldeen Ahmed

Professor of Obstetrics and Gynecology, Weill Cornell Medical School—Qatar, and Dubrovnik International University, Croatia
Head of Fetomaternal Medicine Unit, Women's Hospital, Hamad Medical Corporation, Doha, Qatar

Zohra Hasnani (Corresponding Author)

RN, MN, Fetomaternal Medicine Unit, Women's Hospital, Hamad Medical Corporation, Doha, Qatar, e-mail: zhasnani@gmail.com