Cervical length for predicting preterm birth and a comparison of ultrasonic measurement techniques

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Abstract

Introduction: Preterm birth is the leading cause of neonatal morbidity and mortality not attributable to congenital anomalies or aneuploidy. It has been shown that a shortened cervix is a powerful indicator of preterm births in women with singleton and twin gestations – the shorter the cervical length, the higher the risk of spontaneous preterm birth. Ultrasound measurements of the cervix are a more accurate way of determining cervical length (CL) than using a digital method.

Background: There are three approaches that may be used to perform ultrasound measurements of the cervix; these are the transabdominal (TA), transperineal (TP) and the transvaginal (TV) approach. The TV approach is considered to be the gold standard. In women who are considered to be at a high risk of preterm birth it is now recommended that the cervix is measured at the mid-trimester ultrasound using the TV ultrasound approach. For women considered to be at a historical low risk the TV scan is not recommended, however it has been found that many women who deliver a preterm baby have no known risk factors.

Conclusion: There is contradictory evidence in the literature with regard to the correlation between TA, TP and TV measurements. This article provides an overview of these three approaches with a focus on the clinical value for the assessment of the maternal cervix.

Keywords: cervix, preterm birth, ultrasound, transvaginal, transabdominal, transperineal.

Background

Preterm birth (PTB) is defined as delivery before 37 weeks of gestation. This occurs in 5% to 11% of all pregnancies, with a range as low as 4.5% in Ireland and as high as 15% in the United States.[1] In 2007, the preterm birth rate in the United States was 12.7% with approximately 2% of infants born before 32 weeks gestation.[2] In 2010, the preterm birth rate in Australia was 8.3%,[3] an increase from 6.7% in 2003.[4] PTB is the leading cause of neonatal morbidity and mortality not attributable to congenital anomalies or aneuploidy. If an infant is born preterm the risk of death in the first year of life is 40-fold greater compared with an infant born at term.[1]

Infants born preterm represent half the children with cerebral palsy, one third of those with abnormal vision, one quarter of those with chronic lung disease, and one fifth of children with mental retardation. In adulthood there is an increased risk of behavioural problems, lower levels of education achievement, reduced rates of reproductive success and an increased incidence of second generation PTB. Given the substantial and far reaching impact of preterm birth, it is important to recognise patients at increased risk of PTB.[1]

Over the last decade, little progress has been made in understanding and preventing preterm birth, and the incidence of spontaneous preterm birth has continued to rise, even in low risk women.[5]

Risk factors for Spontaneous PTB

A number of risk factors are involved in the development of spontaneous PTB,[6] which are detailed as follows:

- Reproductive history of previous spontaneous preterm birth and use of assisted reproductive technology.
- Antepartum bleeding, rupture of membranes, cervical insufficiency, uterine anomalies, fibroids and excisional cervical treatment for cervical intraepithelial neoplasia.
- Fetal/uterine factors of multifetal gestation, fetal anomaly and polyhydramnios.
- Infection due to chorioamnionitits, bacteruria, periodontal disease, current bacterial vaginosis.
- Demographic factors of low socioeconomic status, single marital status, low level of education, First Nations ethnicity, or maternal age < 15 years or > 35 years.
- Lifestyle issues including cigarette smoking, illicit drug use, stress and physical abuse.
- Inadequate prenatal care, low pre-pregnancy weight and poor weight gain in pregnancy.

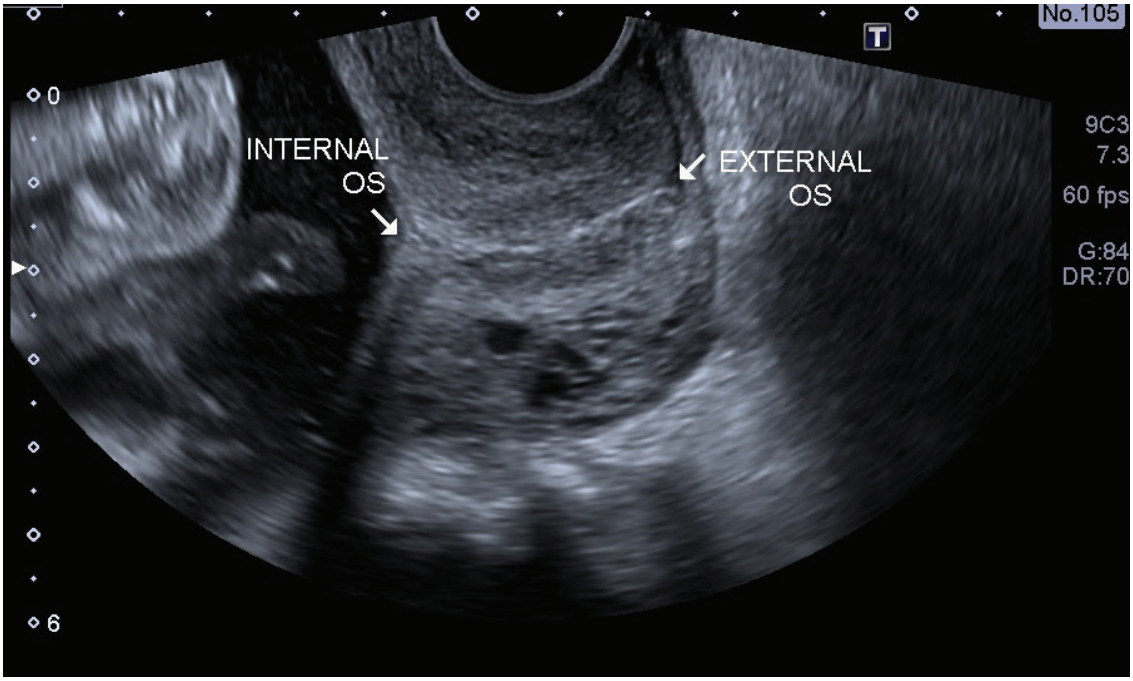

Figure 1: TVU image of the cervix at 20/40 shows the cervical canal with the internal os seen with a typical V-shaped notch, and the external os seen with a triangular notch and the echogenic cervical canal surrounded by the mildly hypoechoic cervical glandular tissue.

However, many women who deliver preterm do not have any known risk factors.[6] The risk factor with the best correlation to preterm birth is a history of prior preterm birth(s). These women have a 2.5-fold increase in risk of PTB. However this risk factor is not useful in the nulliparous patients who make up nearly one half of all patients experiencing PTB[2] (Figure 1).

Length of cervix to predict PTB

The cervix lies distal to the uterine body, and is bounded superiorly by the uterine isthmus. The internal os is the anatomical and histological junction of the muscular uterus and the fibrous cervical stroma. The endocervical canal extends from the internal to external os[5] (Figure 1).

Evaluation of the cervix has been used as a tool to predict PTB based on the concept that the cervix acts as an anatomic marker of the underlying pathologic process leading to preterm delivery. The cervical length (CL) has been measured using a digital examination in the past. Investigations using transvaginal ultrasound measurement as the standard confirmed that digital examination underestimates cervical length and the majority of studies found that ultrasound assessment of cervical length is superior to clinical examination for the prediction of PTB.[6] The traditional approach to evaluate the length of the cervix is now using sonographic visualisation. There are three ultrasound approaches that may be used to measure the cervical length. These are the transabdominal (TAU), transperineal (TPU), also known as translabial and the transvaginal ultrasound (TVU) approach.[1]

Shortening and funnelling of the cervix was first described to be associated with the diagnosis of incompetence, however it was Andersen, *et al*.[7] who first raised the possibility that the transvaginal sonographic measurement of CL could be used to predict a risk for preterm delivery for a significant proportion of preterm birth. Therefore, morphological measurements on ultrasound examinations have become increasingly important.

The use of transvaginal ultrasound examination of the cervix is now widely recommended as part of the surveillance of women at high risk of preterm delivery. Its use as a screening tool in a low risk population is more debatable.[8]

Cervical insufficiency is defined as the inability of the uterine cervix to retain a pregnancy in the absence of contractions or labour. Although CL is a good predictor of preterm birth, the exposure of the membranes to ascending infection seems to be the crucial precipitating factor as even a short closed cervix with a length of < 10 mm can result in a term pregnancy. Cervical length assessed by TVU is a far better predictor of PTB than past obstetric history, as the cervix shortens the likelihood of subsequent preterm delivery increases, although its accuracy is still dependent on a woman's risk status assessed by her history. The risk of PTB in a low risk woman with a cervix < 25 mm is half that of a high risk woman with a similar cervical length.[5] Romero, *et al.*[9] concluded that the shorter the CL, the higher the risk of spontaneous PTB. Although a clear relationship between a shortened CL and PTB has been established, it is important to remember that most women (75%) with shortened cervices do not deliver preterm.[10]

For ease of clinical use, 25 mm has been chosen as the 'cut off' at above which a cervix can be regarded as normal, and below which can be called short.[11,12] A cervix that is less than 25 mm may be indicative of preterm birth.[1] A cervical length < 25 mm before 28 weeks gestation is abnormal and associated with a higher incidence of PTB, women with a cervical length < 25 mm and contractions have twice the incidence of PTB than women with a cervical length < 25 mm but no contractions.[11]

Mechanisms for development of a short CL

There are three main mechanisms that have been associated with the development of an asymptomatic short CL.[13]

First, the most obvious hypothesis is that a short CL is caused by an intrinsic weakness of the cervix or cervical insufficiency (this term is preferred rather than cervical incompetence). This cervical insufficiency is due in most cases to traumatic or surgical damage, or much more rarely, a congenital disorder or

Table 1: Diagnostic accuracy of ultrasound measurements of the maternal cervix.

Authors	Year of publication	No. of patients	Gestation	Study type	Study results	Conclusions
To, *et al*.[25]	2001	149	22–24	TA vs. TV	TA < TV MD pre void CL 2.82 mm MD TACL pre+post void 4.2 mm	TA CL obtained in 49% cases. Cervix not seen in 85% of cases with CL< 20 mm. MD in TA CL increased with increasing bladder volumes
Saul, *et al*.[26]	2008	287	14–34	TA vs. TV	TA = TV Mean TACL 3.57 mm Mean TVCL 3.61 mm	CL with post void TA demonstrates notable correlation with TV CL (TA images Post Void)
Stone, *et al*.[27]	2010	203	18–20	TA vs. TV	TA < TV Mean TA CL 36.6 mm Mean TV CL 39.1 mm	If TA CL > 25 mm, TV CL not needed in low risk population (TA images Post Void)
Hernandez-Andrae, *et al*.[28]	2012	220	6+2–39	TA vs. TV	TA > TV (For CL< 25 mm)	TA overestimated a short CL as seen on TV. Increased accuracy with normal CL (TA images taken Pre Void)
Friedman, *et al*.[29]	2013	1349	18–23+6	TA vs. TV	TA < TV Mean TV CL 36.1 mm Mean TA CL 34.6 mm (PreVoid) Mean TA CL 33.5 mm (PostVoid)	Recommend if TA CL< 35 mm TV CL should be performed
Carr, *et al*.[30]	2000	84	14–40	TV vs. TP	TP ≠ TV MD CL 3.7 mm	TP CL successful in 95% patients. TV and TP CL not interchangeable
Cicero, *et al*.[31]	2001	500	22–24	TV vs. TP	TP = TV MD CL 0.2 mm	TP may offer an acceptable alternative to TV for CL, adequate imaging in 80% of patients with good correlation of TV & TP CL
Hertzberg, *et al*.[32]	2001	64	14–38	TV vs. TP	TP < TV Mean TP CL 28.4 mm Mean TV CL 30.1 mm	TV images frequently superior to TP images. TP CL shorter over all gestational ages and especially before 20 weeks
Yaziki, *et al*.[33]	2004	357	24	TV vs. TP	TP = TV MD CL 1 mm	TP CL successful in 89% patients, when TP CL seen well, good correlation between TV and TP CL
Ozdemir, *et al*.[34]	2005	104	10–34	TV vs. TP	TP = TV MD CL 2.8 mm at 10–14wks MD CL 1 mm at 20–24&30–34wks	TP CL successful in 91% patients, and interchangeable with TV for CL, with mean CL differences within acceptable range
Meijer-Hoogeveen, *et al*.[35]	2008	71	11–41	TV vs. TP	TP ≠ TV MD CL 3rd trimester -3 mm MD CL 2nd trimester -3.2 mm	Good correlation of TV and TP CL in the 3rd Trimester (TP < TV), greater discrepancy in 2nd trimester (TP > TV)

a connective tissue disease. It is interesting to note that almost all women, even the most high-risk, have a normal CL in the first trimester. This is probably because the pressure the growing gestational sac exerts on the cervix will be unlikely to open up even the weakest of cervices.[13] Thus screening of the CL is not very effective when performed before 14 weeks gestation.[11]

Second, another hypothesis is that a short CL is due to an inflammatory or infectious process as there is a strong association between a short CL on TVU and infection.[13]

Third, recent studies have shown that the majority of asymptomatic women with CL less than 25 mm before 24 weeks have some contractions, more than controls with a normal cervix. It is unclear whether contractions cause the short CL, or are a result of the short cervix, or whether these two factors are working synergistically.[11,13] Pregnant women clearly experience contractions without associated cervical dilatation; sometimes, they experience cervical dilatation in the absence of contractions.[14]

Most probably all three, as well as other mechanisms, often act synergistically in certain women to contribute, in each individual in different ways, to the development of a short CL.[13]

There is an increased risk of developing a short CL in patients with a previous preterm birth or a cervical suture in-situ. The risk is increased also in patients with a previous instrumentation of the cervix (Cone biopsy or LLETZ procedure) or uterus (dilatation and curettage), or patients carrying a multiple pregnancy.[6,11]

Transvaginal ultrasound as a screening tool for the maternal cervix

A study conducted in 1998 by Taipale, *et al.*[15] involved a cohort of 3694 women who had a TA and TV scan of the cervix performed at 18 to 22 week scan. Another study by Hassan,

et al.[16] looked at a retrospective cohort of 6877 patients. Both studies confirmed the relationship between the risk of preterm delivery and the functional length of the cervix but showed the limitations of this method for screening in the general population. Due to its relatively low sensitivity and low predictive value for prematurity, transvaginal sonography concomitantly with routine transabdominal screening may not be universally justified.[15]

Routine TVU of the cervix performed between 18 and 22 weeks helped to identify patients at risk of preterm delivery; nonetheless, the low prevalence of preterm births in these populations at low obstetric risk is a limitation to the development of screening which brings in either a high false-positive rate if the cut off for normal cervical length is 29 mm (3.6%), or a low sensitivity with a cut-off of 15 mm (8.2%).[17]

In a recent study by Hassan, *et al.*[18] involving a trial of 32,091 women, it was found that 2.3% or 733 of these women had a cervix length between 10–20 mm. All cervix lengths were measured using a TV approach. Half of the 733 women were treated with progesterone vaginal gel and the other half a placebo. There was a 44% reduction in the rate of spontaneous preterm deliveries before 34 weeks of pregnancy in the progesterone group.[18] It has been suggested that a TV scan in the second trimester of singleton pregnancies carried out between 19 and 24 weeks to measure cervical length is the best method with which to identify a group of women (approximately 2% of the pregnant population) who would benefit from a prophylactic progesterone treatment to prevent spontaneous PTB.[19]

At the Australasian Society for Ultrasound in Medicine (ASUM) 2011 scientific meeting Professor Jon Hyett stressed in his presentation that a failure to assess the cervical length in obstetric scans performed at less than 34 weeks could be judged as negligent. It was his opinion that the cervix could not be seen using a transabdominal scan. He recommended that all low risk asymptomatic women should now have the transvaginal scan as part of their mid trimester ultrasound scan to measure the length of the cervix. He recommended this as progesterone treatment of the cervix had been successful in reducing preterm births in 40% of women, whereas in the past cervical cerclage as the main treatment option was often ineffective.[20]

The 2009 *Cochrane Review for Cervical Assessment by Ultrasound for Preventing Preterm Delivery* states that currently there is insufficient evidence to recommend routine screening of asymptomatic or symptomatic pregnant women with TV ultrasound CL.[21] The 2013 *Cochrane Review for Cervical Assessment by Ultrasound for Preventing Preterm Delivery* finds that TVU CL is one of the best predictors of PTB in all populations so far. They also found that at this point in time no studies using TAU for CL screening were identified, therefore there were no trials comparing TV versus TA ultrasound for CL. They concluded that there is currently insufficient evidence to recommend routine screening of asymptomatic or symptomatic pregnant women with TVU CL without a specific intervention.[22] The recently published *International Society for Ultrasound in Obstetrics and Gynaecology (ISUOG) Practice Guidelines for Performance of the Routine Mid-trimester Fetal Ultrasound Scan*, also state that currently there is insufficient evidence to recommend routine TVU cervical length measurements at the mid-trimester in an unselected population.[23]

The American College of Radiology recommends TV cervical sonography as a part of every routine obstetric ultrasound in the second trimester. However routine use of ultrasound for cervical length measurement remains controversial in asymptomatic women and the American College of Obstetricians and Gynaecologists (ACOG) does not explicitly recommend this form of screening. ACOG does recommend obtaining a TVU for further assessment of the cervix if it appears short transabdominally.[24]

Transvaginal, transperineal and transabdominal ultrasonic approaches for measuring the maternal cervix

Different cervical parameters have been evaluated as predictors of PTB. CL, as measured from the internal os along the endocervical canal, is the most reproducible and reliable measurement. A short cervix is usually straight, and the presence of a curved cervix generally signifies a CL greater than 25 mm. If the cervix is mildly curved a straight line measurement may be used, if the curve is more pronounced with a deviation of > 5 mm from the straight line, the CL can be measured with the sum of two straight lines.[10]

The curved cervical canal may also be measured by tracing the canal from internal to external os.[24] On some ultrasound machines there is also the option of plotting 3 or more points along a curved line to trace the endocervical canal (called a spline trace on some equipment).

The maternal cervix may be imaged ultrasonically by all three TA, TP and TV approaches. A number of studies have been published in the literature with regard to the accuracy of measurements among these three methods. Table 1 is a summary of these findings. There have also been a small amount of studies that have evaluated the acceptability of the TVU and TPU approaches for CL. They are summarised in Table 2.

Transabdominal approach

The TA approach can be used to measure CL with a full and empty or partially full maternal bladder. The cervix is a dynamic organ and it is important to assess the cervix multiple times throughout the duration of the obstetric examination. The echogenic cervical canal should be seen in its full length. The adjacent hypoechoic cervical glandular tissue may also be visible. The caliper placement for the internal os should be adjacent to the cervical canal at the point where the opposing fornices of the cervix come together and form a flattened T-shape appearance or a small V-shaped notch may be seen. The calliper placement for the external os should be adjacent to the cervical canal at the point where the cervix meets the vagina. This often appears as a very slight indentation, the outline of the cervical corpus should also be used as a guide for calliper placement of the external os.[26]

The full bladder TA approach can be problematic in that pressure from the full maternal bladder can falsely elongate the cervix. Compression of the cervical canal makes it difficult to assess the cervical glandular tissue delineating the true cervical canal. It may also mask the presence of premature rupture of membranes (PROM). Persisting with an overly distended bladder also seems to increase the chance of a lower uterine contraction developing, which can then make defining the true CL technically difficult.

An empty bladder may give adequate visualisation of the full cervical length. A partially full to empty bladder will reduce the

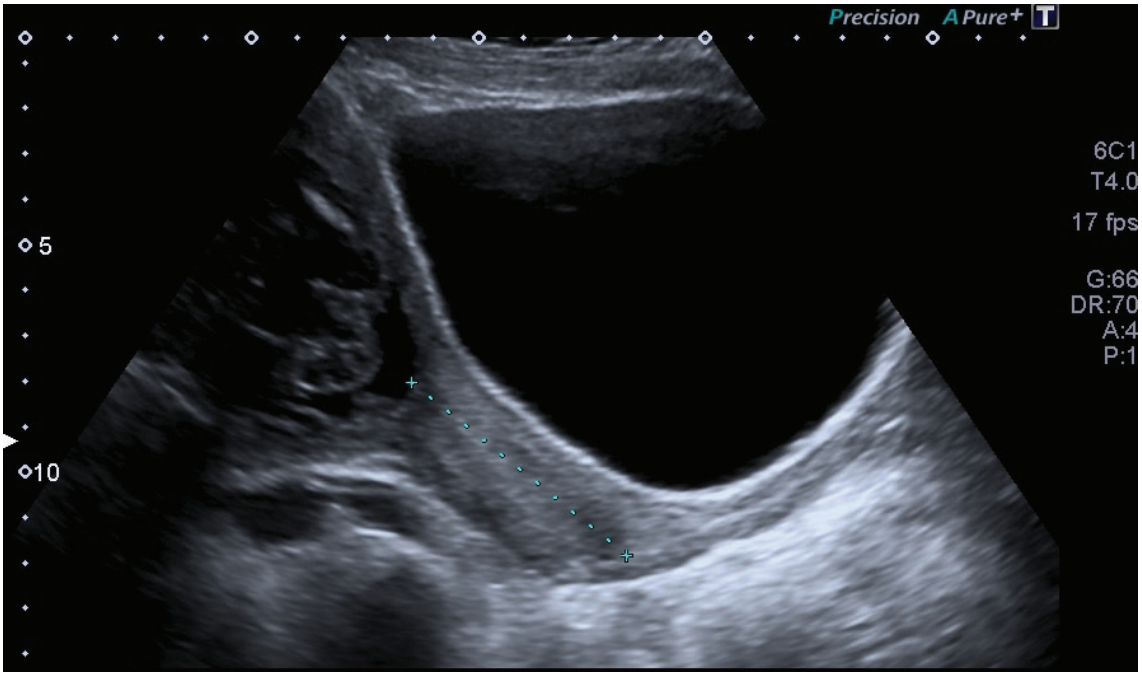

Figure 2: Pre void TAU image of the cervix, the full bladder causes artifactual lengthening of the cervix with the cervical length measured at 61.5 mm.

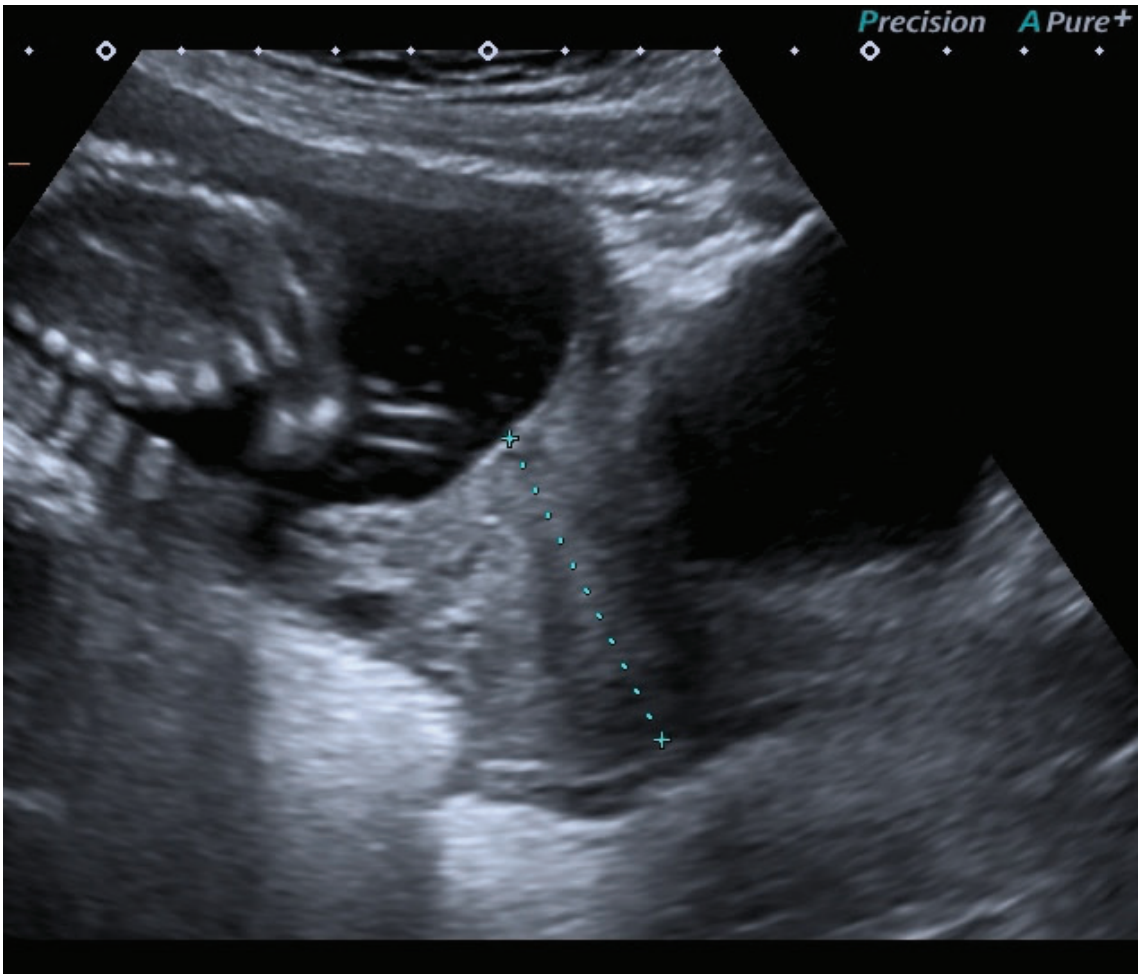

Figure 3: Post void TAU image of the cervix with the empty bladder alleviates the artifactual lengthening of the cervix, and it has a normal curved appearance with a cervical length measurement of 41.3 mm.

compression of the cervical canal to alleviate the false elongation and the cervix should now be seen 'open' in a case of PROM.

It is important to use a more cephalid approach on the maternal abdomen with a caudal tilt of the transducer, this utilises amniotic fluid as a window for visualisation of the cervix. Many patients exhibit the 'curved' cervix post void (Figure 2). In some patients the cervix will appear quite 'vertical' post void (Figure 3).

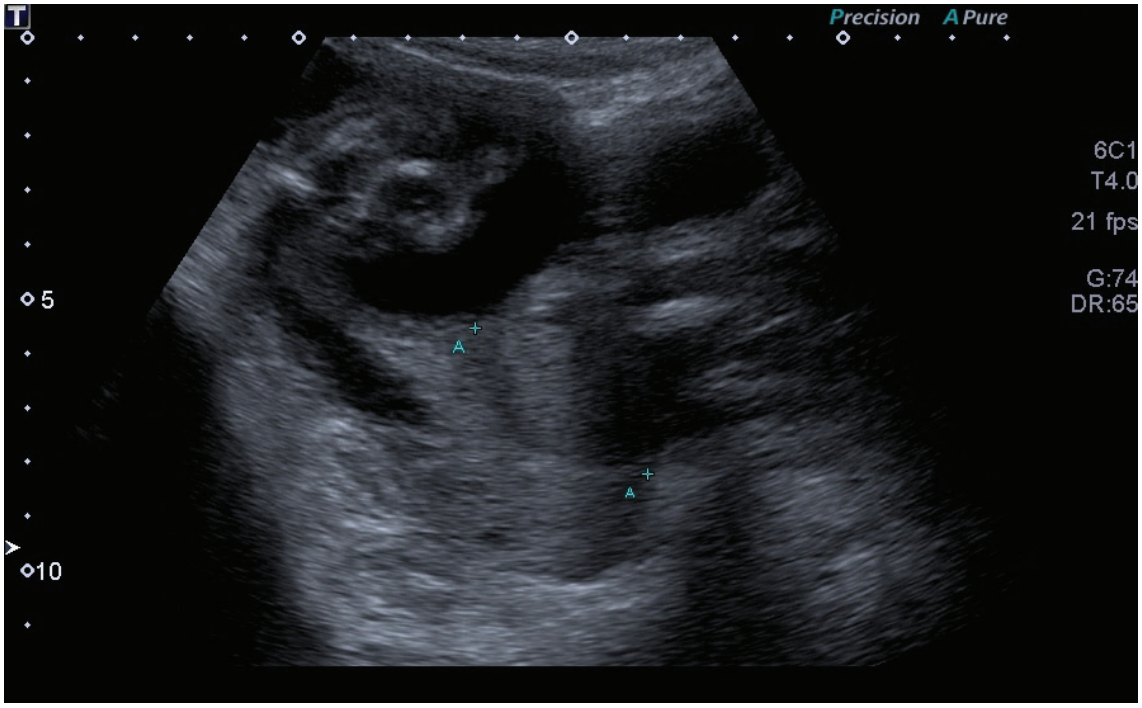

Figure 4: Post void TAU image of the cervix demonstrating a curved appearance of the cervix.

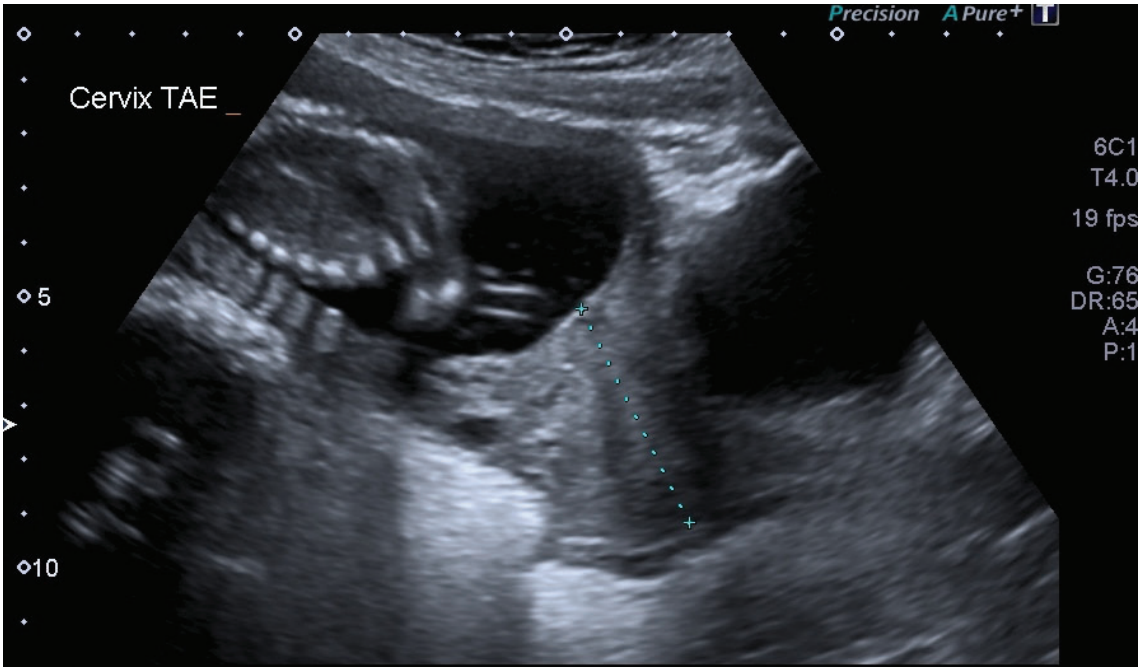

Figure 5: Post void TAU image of the cervix demonstrating a vertical appearance of the cervix.

It has been found by some authors that accurate measurements have not been obtained by the TA approach in 50% of cases.[5] Saul, *et al*.[26] found that a TAU CL of ≤ 30 mm was 100% sensitive for a TVU CL of ≤ 25 mm. As yet no studies using TAU for CL screening to predict preterm birth have been identified.[22] Figure 4 is an example of a TAU image of the cervix with a full bladder and Figure 5 shows the same cervix post void.

Transperineal approach

The transperineal ultrasound approach can be useful for imaging the maternal cervix. This approach uses the same curvilinear transducer that is used for the transabdominal approach. The TPU approach is performed post void. The echogenic cervical canal should ideally be seen in its full length, the hypoechoic cervical glandular tissue may also be visible. The internal os should be seen at the point where the fornices of the cervix come together and form a flattened T-shape appearance or a small V-shaped notch may be seen. The external os should be adjacent to the cervical canal at the point where the cervix meets the vagina. A small echodense area may be seen on some patients. The posterior cervical corpus should also be used as a guide for calliper placement at the elevated external os.

The transducer is placed in a sterile freezer bag and sterile gel is used as a coupling agent. The patient is placed in the lithotomy position with the hips elevated on a cushion and the transducer is positioned on the labia majora or perineum of the patient. The cervix is imaged from this inferior approach. The transducer is placed in a sagittal plane along the direction

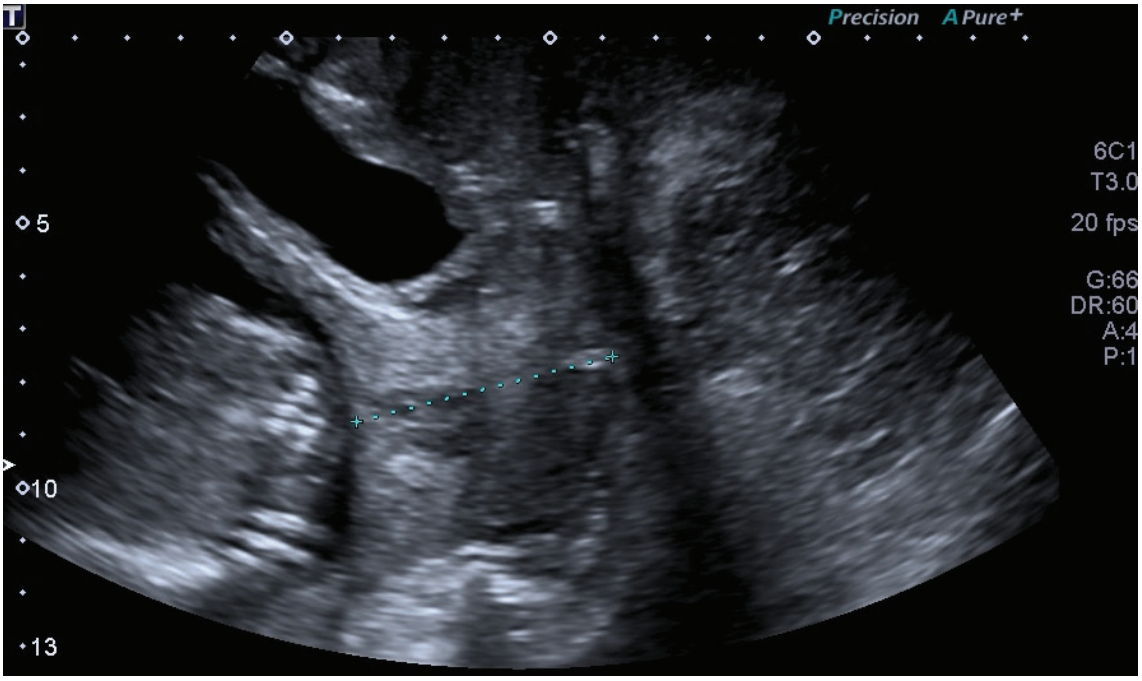

Figure 6: TPU image of the cervix showing the cervical canal and calliper placement at the internal and external os acquired with a lower frequency curved probe (3mHz), and the cervical length is measured at 50 mm.

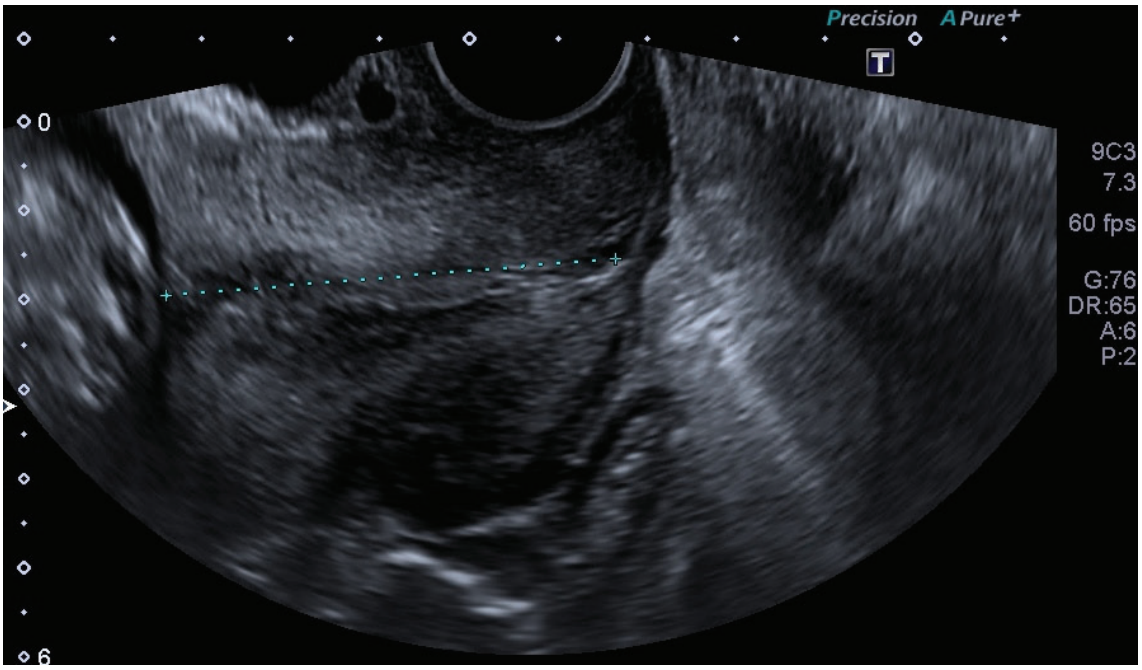

Figure 7: TVU image of the cervix with measurement of the cervix from internal to external os using the higher frequency transvaginal probe (7.3mHz), the cervical length is measured at 50.5 mm.

of the vagina.[1] Oblique or parasagittal movements may be required to delineate the full length of the cervical canal.

On TPU, the most important technical problem is the possible interference of adjacent bowel gas with cervical image.[33] The elevated lithotomy position helps to alleviate rectal gas overlying the external os. The transducer can also be placed with a slightly anterior approach on the labia with a slight posterior angulation to help overcome shadowing from rectal gas. Another technical issue is the distance to the maternal cervix from the transducer face.

In most cases a lower frequency transducer is required than the TA approach. The lower frequency required can make it difficult to appreciate the landmarks of the external os, cervical glandular tissue and internal os. This becomes more problematic in cases where a lower uterine contraction is present.

This approach is often inadequate and not as easy to visualise the canal in up to 25% of women.[5] TPU has been shown to have a sensitivity of 77% in predicting PTB with a false-positive rate of 17% and a relative risk of 4.5 at the 32.5 mm cut off value.[33] In cases where a PROM is suspected or the patient declines the TV approach the TPU is useful.

In patients presenting with vaginismus the TPU approach can also be utilised.[1] TPU has an advantage over TVU in that no pressure is put on the cervix to artifactually elongate the cervical canal, as can occur in the TV approach.[33]

Figures 6 and 7 are examples of TVU and TPU CL performed on the same patient.

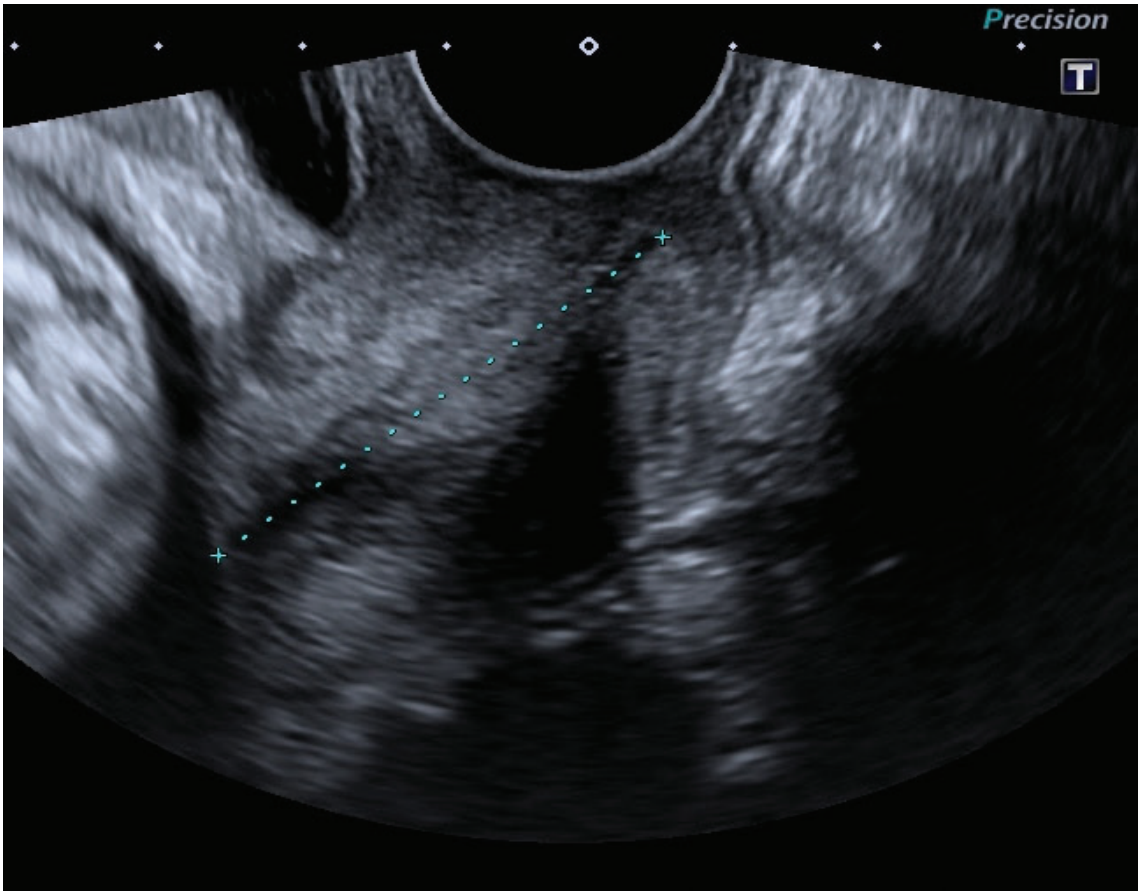

Figure 8: TVU image of the cervix demonstrating a cervix with a 'sloped' appearance.

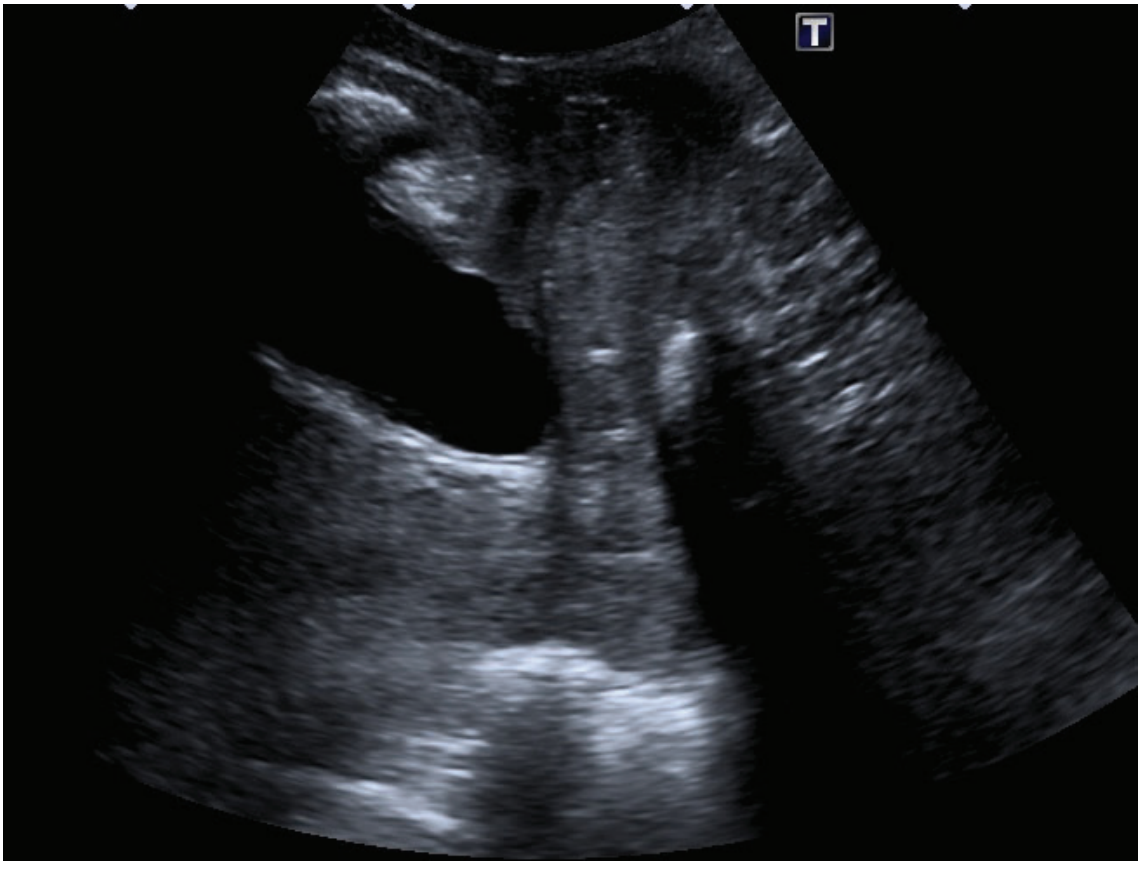

Figure 9: TPU image of the cervix demonstrating a lower segment myometrial contraction, the internal os is difficult to identify due to the contraction.

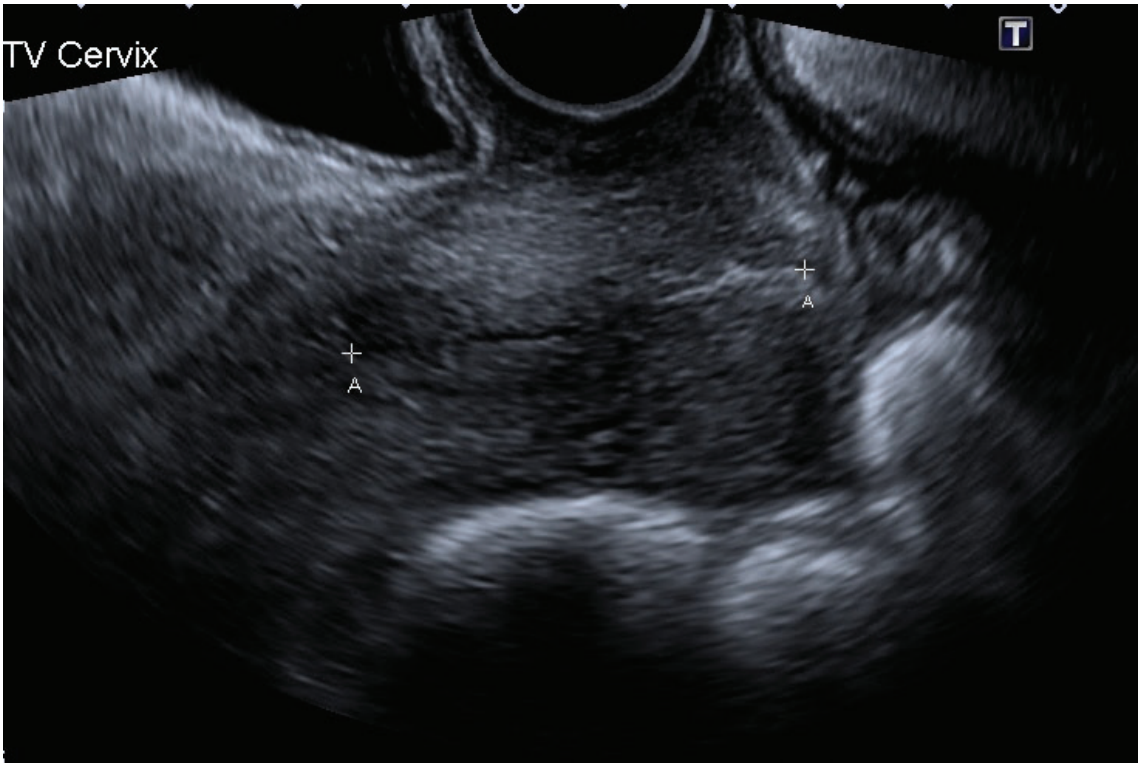

Figure 10: TVU image of the cervix demonstrating a lower segment myometrial contraction, the position of the internal os is ascertained by the cervical glandular tissue.

Table 2: Patient acceptability of TVU & TPU for CL.

Authors	Year of publication	No. of patients	Gestation	Study Results
Cicero, *et al*.[31]	2001	500	22–24	TPU more acceptable to patients than TVU
Raungrngmorakot, *et al*.[36]	2004	72	> 37	No significant difference in discomfort between TA and TP US. TVU had a significantly higher discomfort score.
Ozdemir, *et al*.[34]	2005	104	10–34	TPU preferred by patients as a less invasive and better tolerated alternative to TVU
Meijer-Hoogeveen, *et al*.[35]	2008	71	11–41	TVU for CL least painful in 2nd and 3rd trimesters
Clement, *et al*.[37]	2003	922	23	85.9% of women found TV acceptable, 5.9% would decline TVU in future, 7.2% high difficulty score (4 or 5 on 0–5 point scale)

Transvaginal approach

The transvaginal approach uses a high frequency endovaginal (intracavity) transducer. The TVU approach is performed post void. The transducer is placed in a probe cover and sterile gel is used as a coupling agent. The patient is placed in the elevated lithotomy position. On the TVU approach the internal os should be seen as flat or with a V-shaped notch, the external os should have a dimple or triangular area of echodensity and the cervical canal should be seen as echogenic with surrounding hypoechoic glandular tissue in varying degrees. Occasionally the canal may also appear hypoechoic.[1]

On TVU the most important technical pitfall is elongation of the endocervical canal due to distortion of the cervix by the transducer. The transducer is placed into the vagina a small distance to visualise the full length of the maternal cervix, the transducer is withdrawn slightly so the image becomes out of focus, and then the transducer is repositioned till the cervix just comes into view. This technique is used to alleviate any pressure placed on the cervix which may artifactually elongate the measurement.

The distance from the transducer face to the cervix is reduced compared to the TAU and TPU approaches and due to this a higher frequency is able to be utilised in most cases, increasing the detail of the ultrasonic landmarks of the maternal cervix. In some patients the cervix will have a more 'sloped' appearance and the 'dimple' of the external os can be more difficult to attain (Figure 8). In some cases it is also necessary to reduce the transducer frequency to adequately assess the full length of the cervix. The cervical glandular tissue is usually visualised with greater detail in the TVU approach (Figure 9), than the TPU approach (Figure 10), making measurements of the true cervical length technically easier with the TVU approach in cases with a lower uterine contraction,[3] though lower uterine contractions can be problematic for all approaches.[1] TVU shortened CL is more sensitive (> 50%) in women with an increased risk of PTB, and in women with no risk factors of PTB it has a sensitivity of only 37%[11,15].

Discussion of interventions to prevent PTB

A number of interventions have been proposed in an attempt to

prevent PTB in women at high risk of PTB. Bed rest and hydration are often recommended, but there is no consistent evidence indicating that they are able to delay delivery.[38,39] Similarly, tocolytic medications are often prescribed, but again there are no reliable and consistent data to suggest that any tocolytic agent can delay delivery for longer than 24 to 48 hours.[13]

Cervical cerclage may be performed prophylactically in the first trimester when clinical history suggests a high risk for PTB, or when cervical resistance studies confirm low cervical resistance. Ultrasound indicated cerclage seems to be associated with a reduction in PTB in women with a previous PTB who are carrying singleton gestations and develop a short cervical length in the second trimester.[40] More rarely, a rescue cervical suture may be inserted when the patient presents with a cervix that is already dilated with the membranes bulging into the vagina but not signs of labour, infection or heavy bleeding.[41]

Cerclage is not indicated in low risk patients, as cerclage does not reduce PTB in low risk women with a short cervix.[14] In current clinical practice, only 1 in 25 cerclage are thought to be beneficial.[5]

Progesterone is considered a key hormone for pregnancy maintenance, and a decline of progesterone action is implicated in the onset of parturition. If such a decline occurs in the mid trimester, cervical shortening may occur, and this would predispose to preterm delivery.[9]

Studies by Fonseca, *et al.*[42] in 2009, Hassan, *et al.*[18] in 2011 and Romero, *et al.*[9] in 2012 all found that administration of vaginal progesterone in women with a sonographic shortened cervical length was associated with a significant reduction in the rate of spontaneous PTB and respiratory distress syndrome (RDS). Romero, *et al.*[9] also found that among twin gestations, the progesterone did not significantly reduce the risk of PTB < 33 weeks, and importantly, vaginal progesterone was associated with a significant reduction in PTB < 33 weeks in both low risk women and high risk women with at least one previous spontaneous PTB.

Summary and conclusion

There is sufficient evidence to show that shortened cervical length is a strong indicator for preterm birth and that ultrasound measurements of the maternal cervix have become the preferred method due to reliability and objectivity. Transvaginal ultrasonic measurement is considered to be the most accurate method of measuring the maternal cervix. To date there does not appear to be any studies that have been performed to compare the TA and TP US approaches for cervical length to the TV approach in the mid-trimester. There is conflicting data as to whether it should become common practice to screen the maternal cervix using the TV approach in women who are considered to be at a historically 'low risk' for PTB in their pregnancy, and further research is needed.

It has been found that cervical cerclage is not beneficial in women who have a low risk of PTB who present with a shortened cervical length for their mid trimester ultrasound scans. More recent studies have found a statistically significant success for the use of progesterone as an intervention in patients found to have a shortened cervical length in the mid trimester. Participants were included in these studies if a shortened cervical length (10–20 mm), was found using the TV scan in the mid trimester. None of the studies included data on the success or failure of imaging of the cervical length using any other US approaches. The improvement in extending pregnancies to > 34 weeks may warrant the need for as accurate as possible measurements of cervical length to be obtained in pregnant patients in the mid trimester.

There have been a small amount of studies including feedback from the patients on whether they prefer the TV over the TP approach for imaging the cervix during pregnancy, and there has been conflicting results obtained. Thus, further studies comparing different measurement approaches with inclusion of patient feedback are required to confirm these early reports.

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