

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Cervical length screening

Presented by

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کتابخانه مرکزی دانشگاه علوم پزشکی بابل



Preterm birth (PTB)

Defined as delivery **before 37 weeks** of gestation, occurs in **5% to 11%** of all pregnancies



Preterm birth (PTB)

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.









Preterm birth (PTB)

⚠ Consequences!

Immediate:

- Respiratory distress
- Intraventricular hemorrhage
- Sepsis
- Retinopathy of prematurity

long term:

- **Cerebral palsy** (one-half of them) 
- **Abnormal vision** (one-third of them) 
- **Chronic lung disease** (one-quarter of them) 
- **Mental retardation** (one-fifth of them) 





Preterm birth (PTB)

Classification (SPTB)

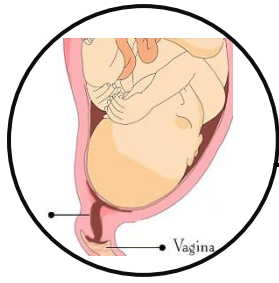
Spontaneous
y PreTerm
Birth



About **85%** of preterm deliveries occur **spontaneously** and are traditionally classified as:

- 1- Preterm labor** (**uterine activity** with coordinated cervical effacement and dilation)
- 2 - Preterm premature ruptured membranes** (**ruptured** fetal membranes in the **ABSENCE** of **uterine activity** and **cervical change**)
- 3- Cervical incompetence** (**cervical dilation** in the **ABSENCE** of **uterine activity**)





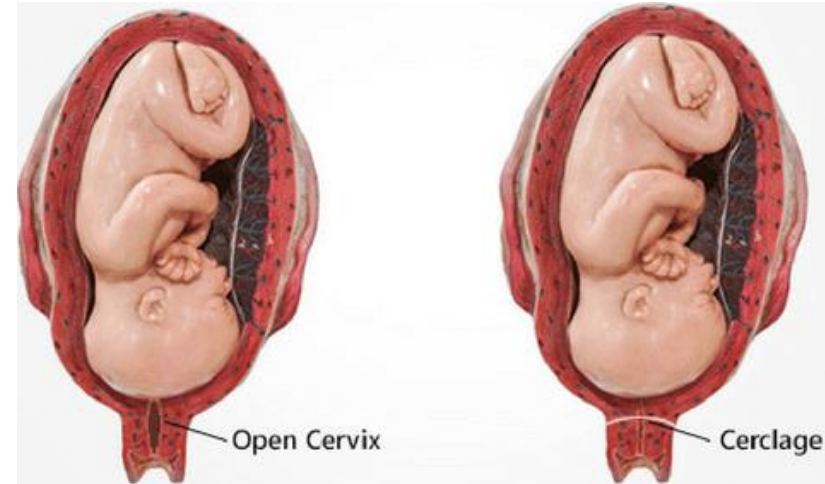
Cervical incompetence

Cervical incompetence:

defined as

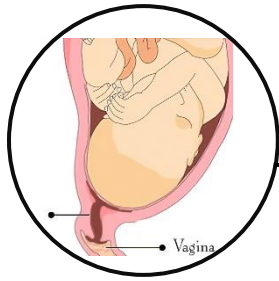
either a **mechanical failure** of the cervix to remain closed against the **increasing intrauterine expansion**

or **functional failure** with **premature** activation of the events of **cervical ripening** (dilation and effacement) that normally occur at term



A tool to predict SPTB

Evaluation of the
cervix

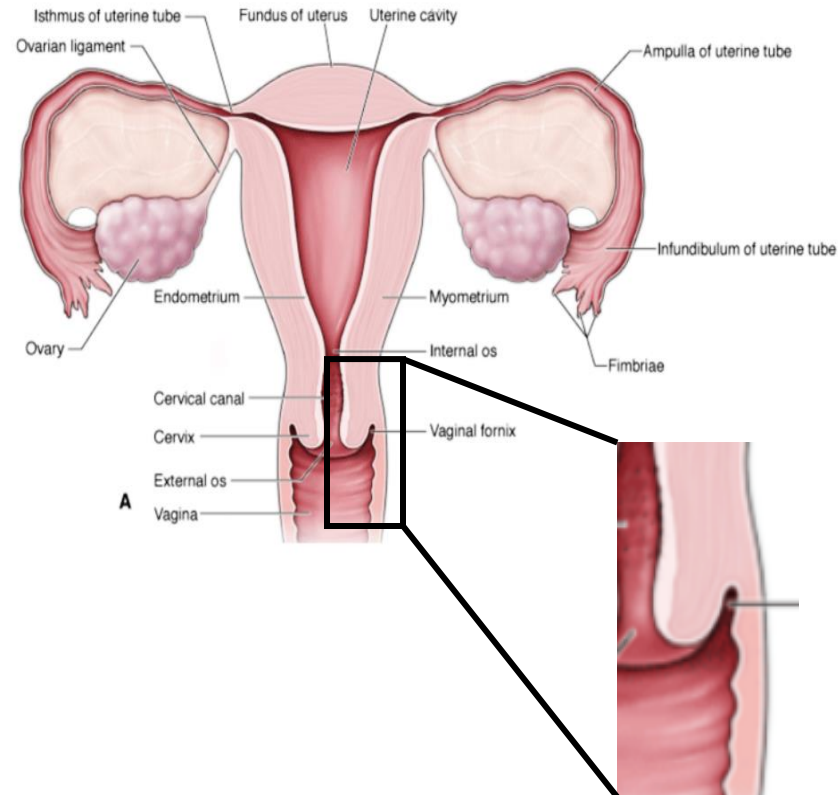


Cervical incompetence

Digital examination

of the cervix measures **only** the length from the **external cervical os** to the **cervical-vaginal junction**, not the intrapelvic cervical-isthmus portion of the Cervix . Therefore digital examination underestimates cervical length by a mean difference of **12 mm** in more than 80% of women in the second and third trimesters compared with sonography.

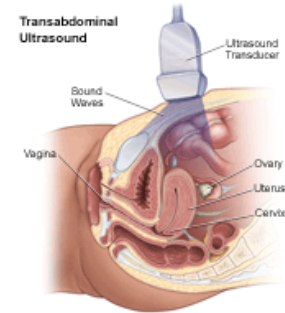
Moreover, dilation of the cervix starts proximally so the distal portion may still appear normal on digital exam, even when the cervix has started to shorten and/or dilate.



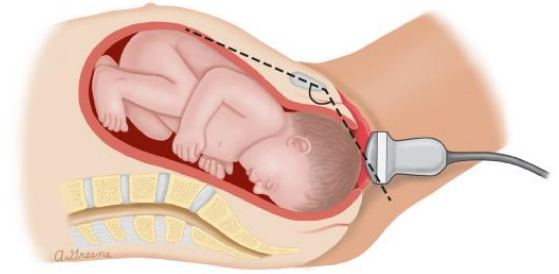


SONOGRAPHY OF THE UTERINE CERVIX

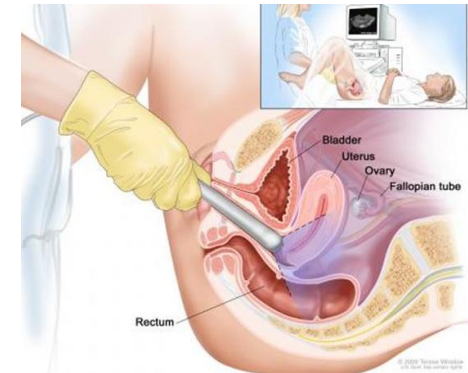
Transabdominal sonography (TAS)



Transperineal TPS or (translabial) Sonography



Transvaginal sonography (TVS).

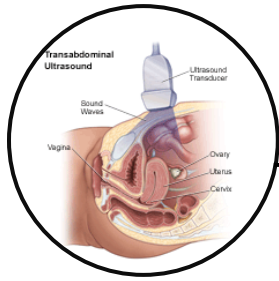




Most important parameter to report

1- The **closed length of the cervix** is the **single most important parameter to report**, as it is most closely linked to the risk of PTB.

2- **Additional** comments include any evidence of **funneling**



Transabdominal Approach

TAS of the cervix is **typically** performed during the **standard second- and third-trimester obstetric ultrasound** examinations and is **used as a routine screening tool** for measurement of closed cervical length.

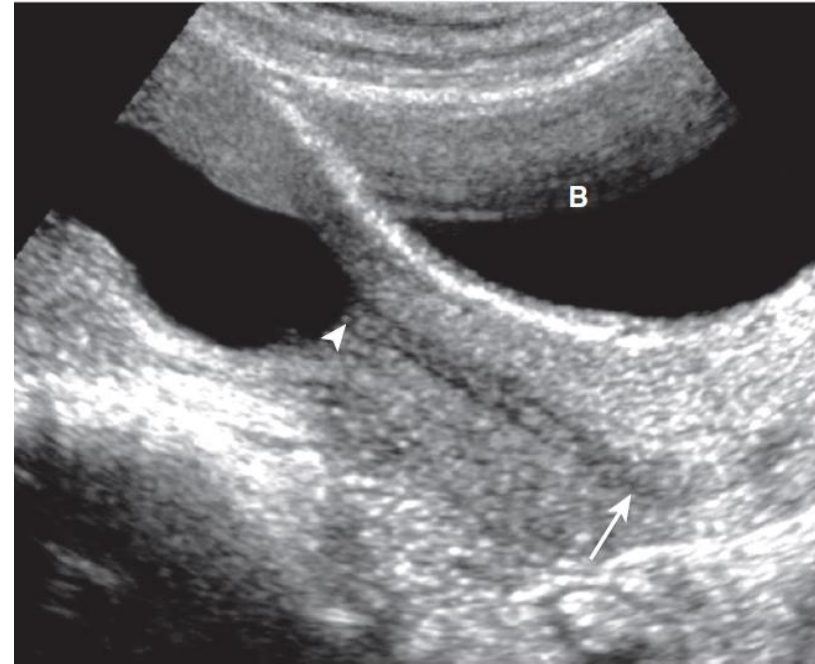
Longitudinal scanning is initiated in the midline of the lower abdomen, just above the symphysis pubis, using a transducer with a frequency of **3 MHz or higher**

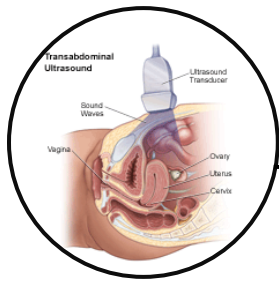
Landmarks:

- **internal cervical os,**
- **the external cervical os,**
- **the outline of the cervical canal,**
- **and the outline of the cervical corpus.**

Measurement of cervical length is **affected by over distention** of the urinary bladder. Increased bladder pressure can compress the lower uterine segment and falsely elongate the cervix or mask cervical dilation.

Cervices less than 2 cm in length cannot be easily visualized against the vaginal and bladder tissue.



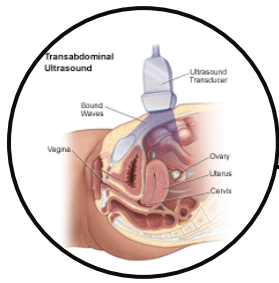


Transabdominal Approach

In the second trimester

IF the urinary bladder is empty, **amniotic fluid** can be used as an acoustic window to scan the cervix.





Transabdominal Approach

In the second trimester

IF the urinary bladder is empty, **amniotic fluid** can be used as an acoustic window to scan the cervix.





Research has demonstrated **conflicting results** regarding the **usefulness of TAS screens in that the cutoff in TAS** to identify a cervix length of **25 mm** or less is variable. This suggests that **higher TAS cutoffs** are required to achieve high sensitivity

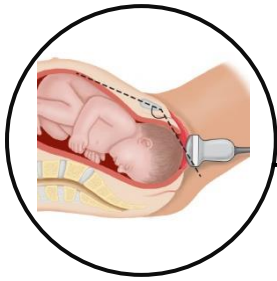
TAS Findings That Indicate TVS Follow-Up

Closed cervical length less than 25 mm (any time <28 weeks)

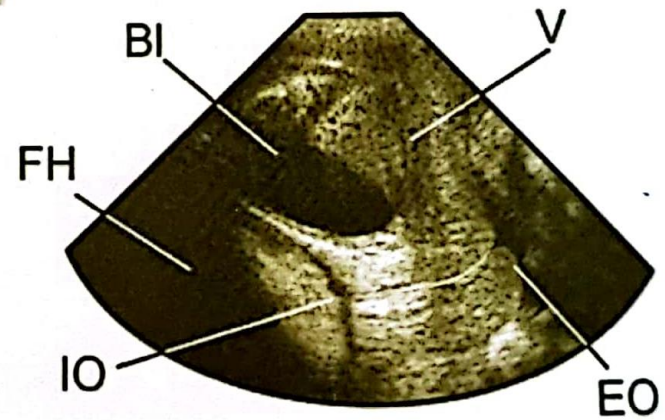
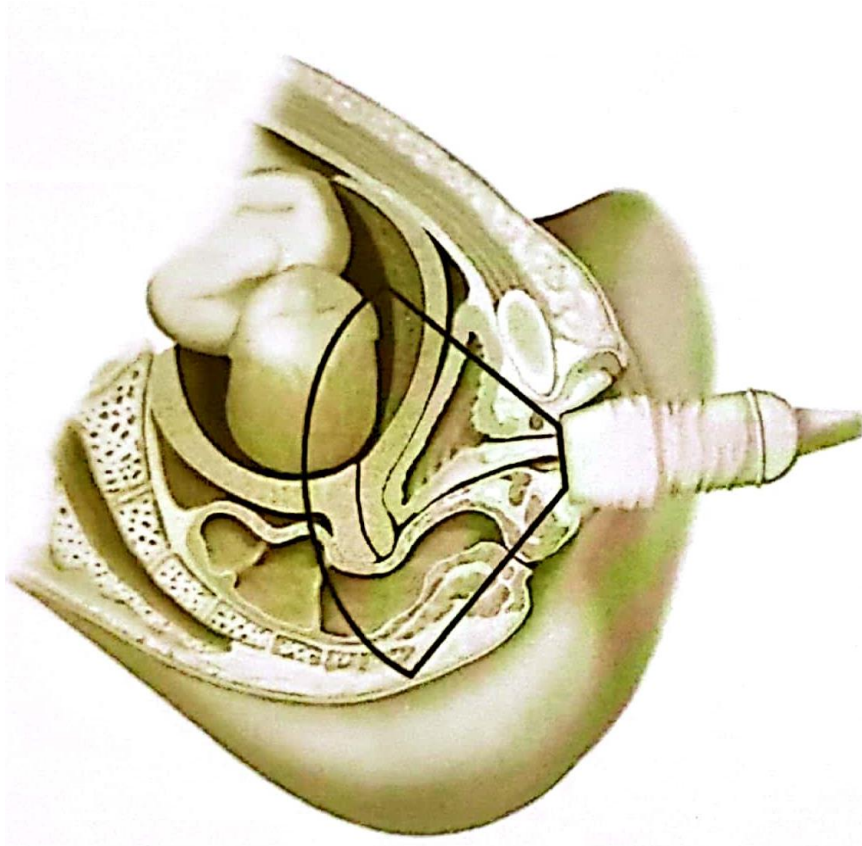
Dilated cervical canal

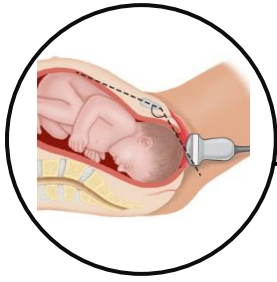
Ballooned, fluid-filled lower segment with no visible cervix

Suspicion of cord or fetal parts prolapse into the cervical canal



Transperineal/Translabial Approach





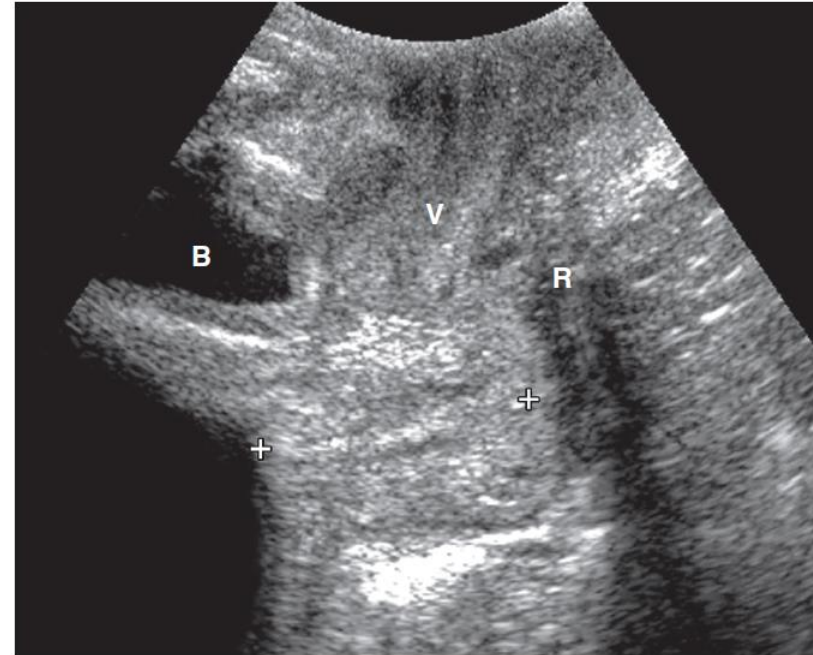
Transperineal/Translabial Approach

Transperineal/Translabial Approach

Transperineal sonography is **reserved for** patients for whom the **cervix cannot be adequately visualized** by TAS, and in whom TVS is unacceptable for personal or discomfort-related concerns.

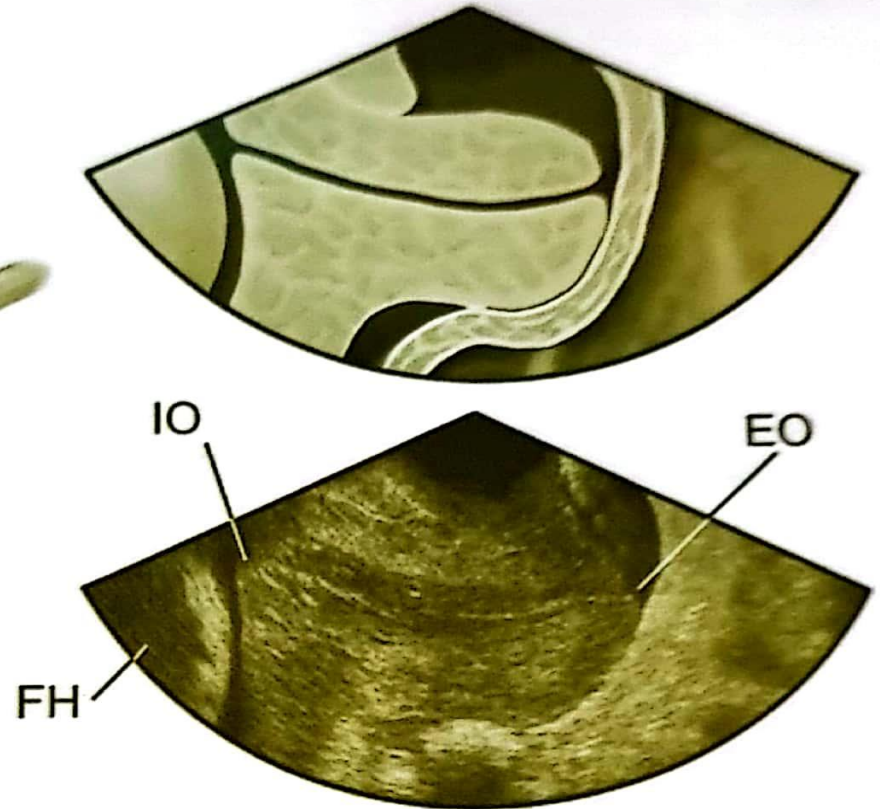
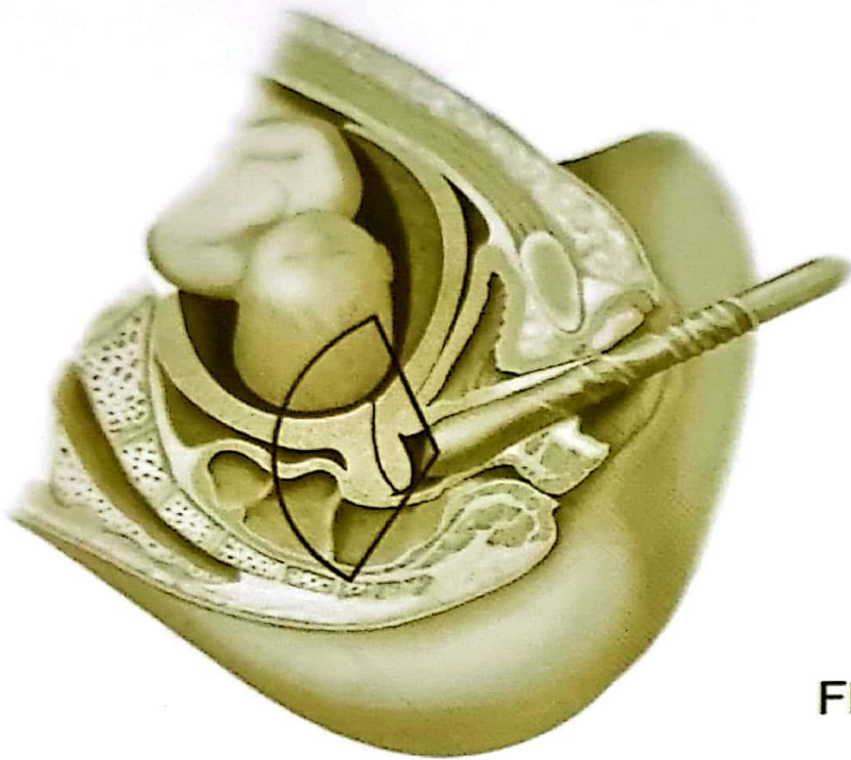
Scanning is performed with an **empty urinary bladder**.

The **full length** of the cervical canal can be visualized in **86% to 96%** of patients





Transvaginal Sonography



A

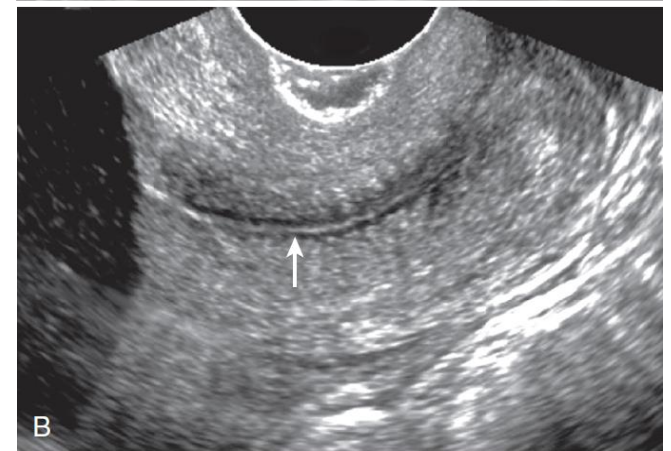
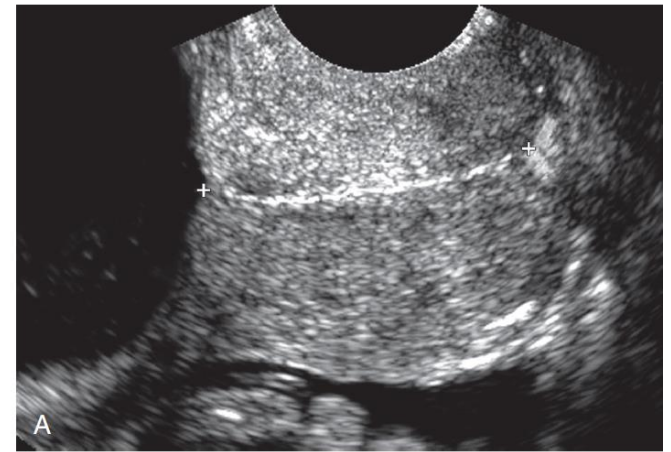


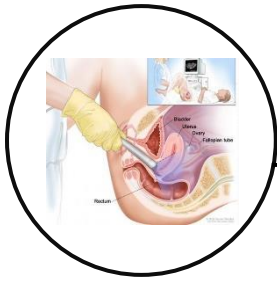
Transvaginal Sonography

TVS is the **reference-standard technique** for accurate determination of:




- **dimensions**
- **characteristics of the cervix**

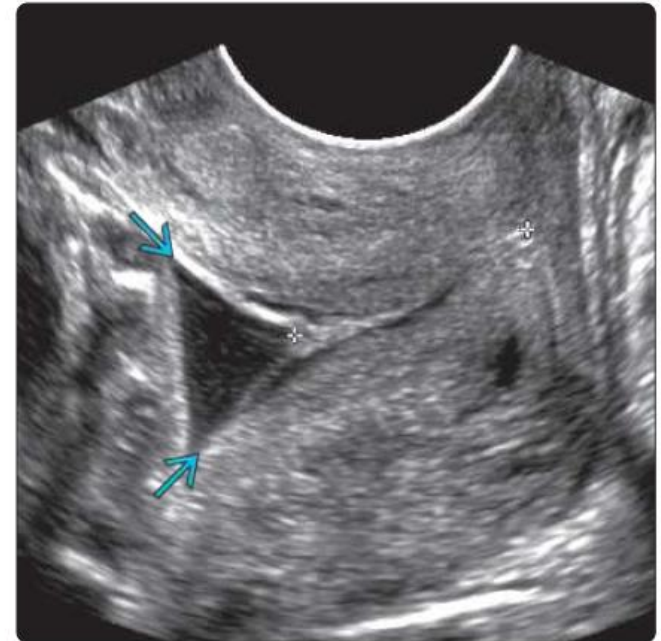
A **symmetrical** image of the external os should be obtained, and the distance from the surface of the anterior lip to the cervical canal should be **equal to the distance** from the surface of the posterior lip to the cervical canal. If the anterior lip appears thinner than the posterior lip, there may be undue pressure placed on the cervix by the transvaginal probe. An additional sign of excessive **pressure** is **increased echogenicity** of the cervix

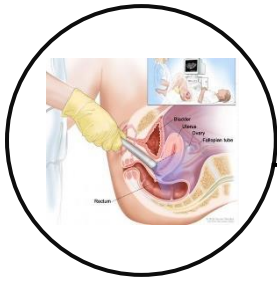




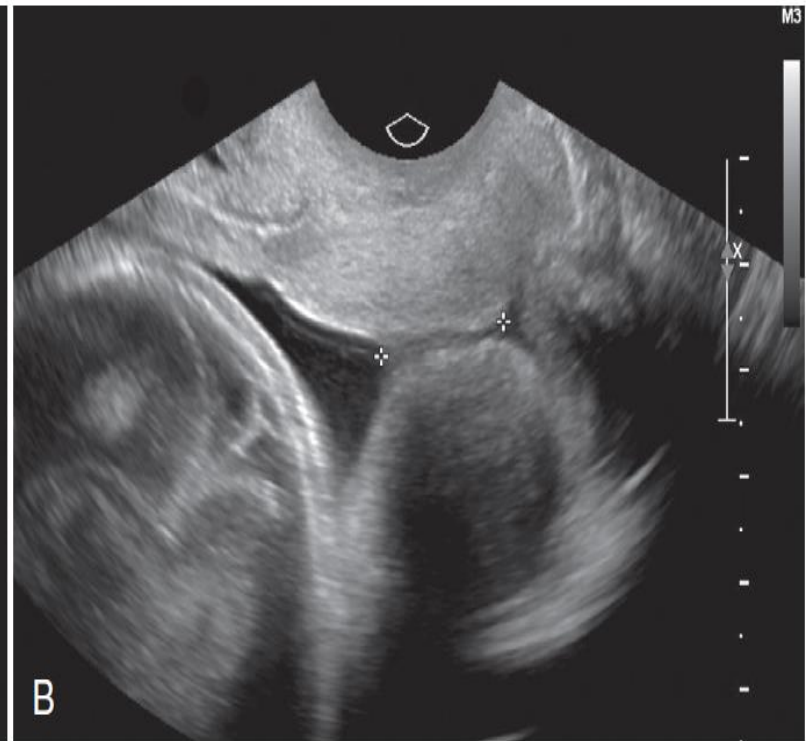
Transvaginal Sonography

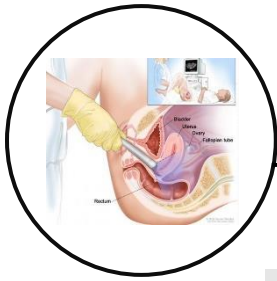
(Left) TVUS shows that the anterior lip of the cervix  is much thinner than the posterior lip  because the transducer is pressing on the cervix. The pressure upon the cervix will falsely elongate the cervix and may hide cervical shortening. (Right) Sagittal image of the same cervix without excessive pressure shows the anterior and posterior lips of the cervix to be equal in thickness and reveals funneling  and a short cervix (calipers). Notice how the membranes form a V shape at the internal os.





Transvaginal Sonography

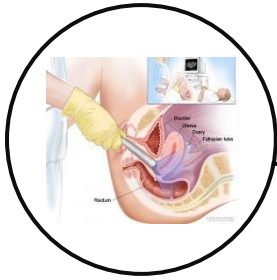




Transvaginal Sonography

Standard Technique for Cervical Measurement

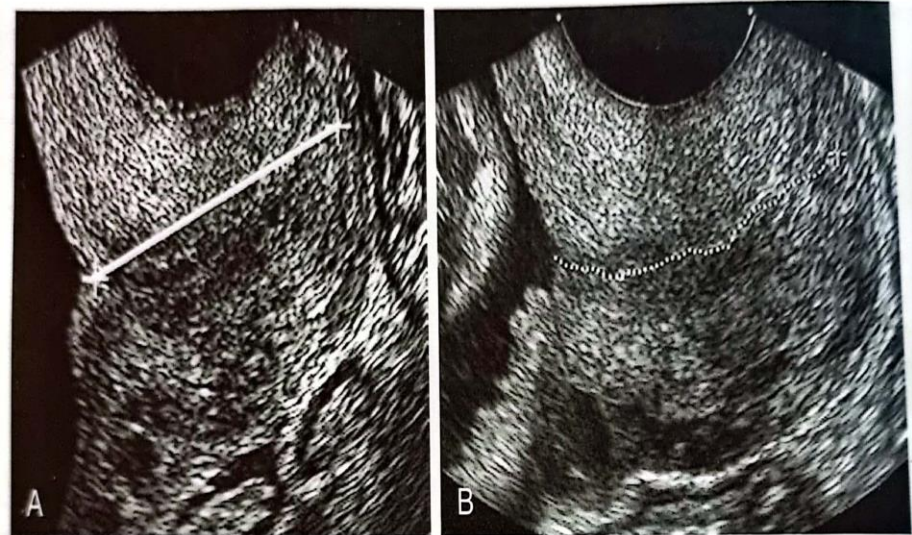
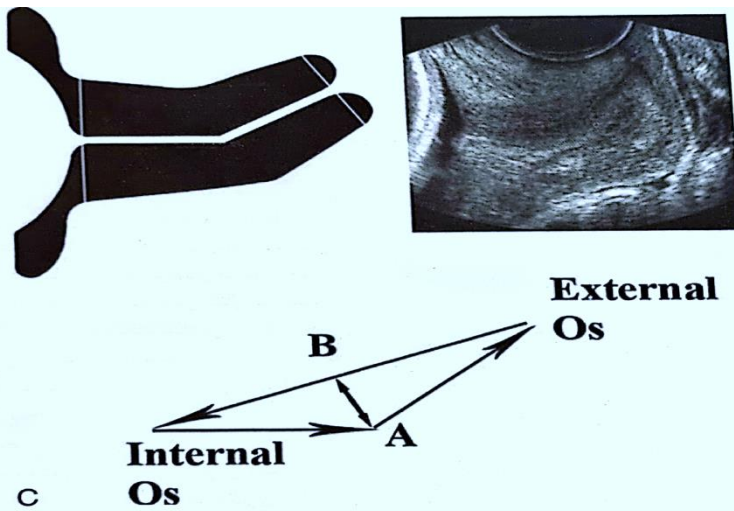
1. Place the probe in the anterior fornix of the vagina.
2. Obtain a sagittal view of the cervix, with the long-axis view of echogenic endocervical mucosa along the length of the canal.
3. Withdraw the probe until the image is blurred, and reapply just enough pressure to restore the image (to avoid excessive pressure on the cervix, which can elongate it).
4. Enlarge the image so that the cervix occupies at least two-thirds of the image and external and internal os are well seen.
5. Measure the cervical length from the internal to the external os along the endocervical canal.
6. Obtain at least three measurements, and record the shortest best measurement in millimeters.

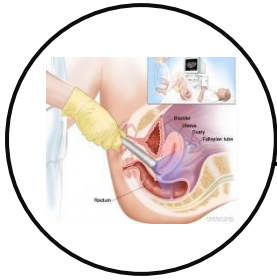


Transvaginal Sonography

When the cervix appears curved

(deviation of the central canal of >5 mm from a straight line connecting the external and internal os), the cervical length can be either **traced** or the sum of **two straight lines** that follow the curve can be used. Using these standard criteria, the inter observer coefficient of variation can be improved to 3.3%.

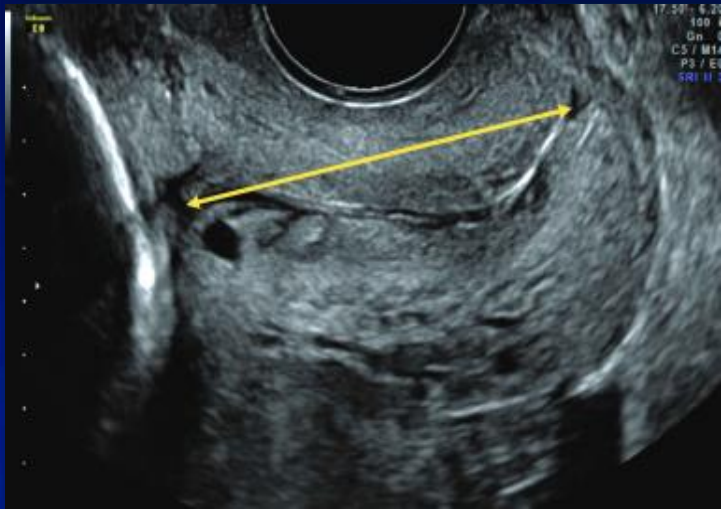




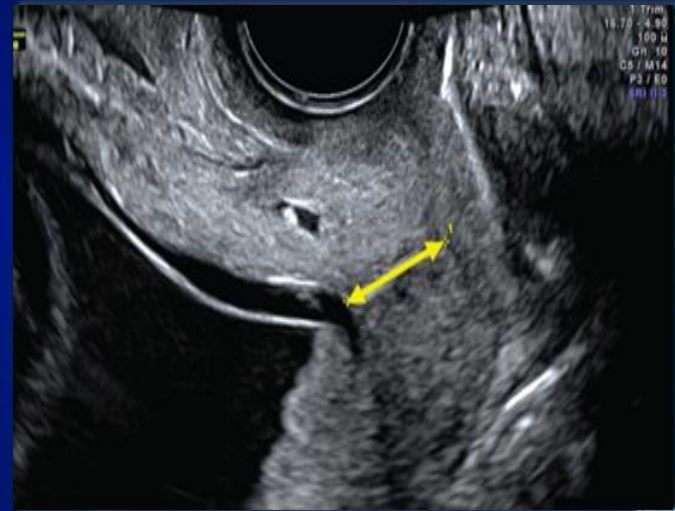
Transvaginal Sonography

What to measure

Curved = long



Short = straight





Transvaginal Sonography

TVS is superior to the TAS technique.

- Higher-frequency transducers
- closer proximity to the structures studied allow for better resolution

Potential complications of TVS :

- increased risk of bleeding in the presence of placenta previa
- induction of uterine activity in women with cervical shortening caused by cervical stimulation
- chorioamnionitis in the presence of ruptured membranes

However, increased risk of chorioamnionitis or neonatal sepsis with TVS after preterm premature rupture of membranes (PPROM) has **not been demonstrated**. TVS has also been deemed **safe to use** in patients with placenta previa with no increased risk for bleeding; however, caution is advised to ensure that the probe is always carefully inserted under real-time visualization.

Cervix: Abnormal Findings on TVS^a

Shortest closed cervical length <25 mm

Presence of funneling

Presence of positive response to fundal pressure

Presence of amniotic fluid debris ("sludge")

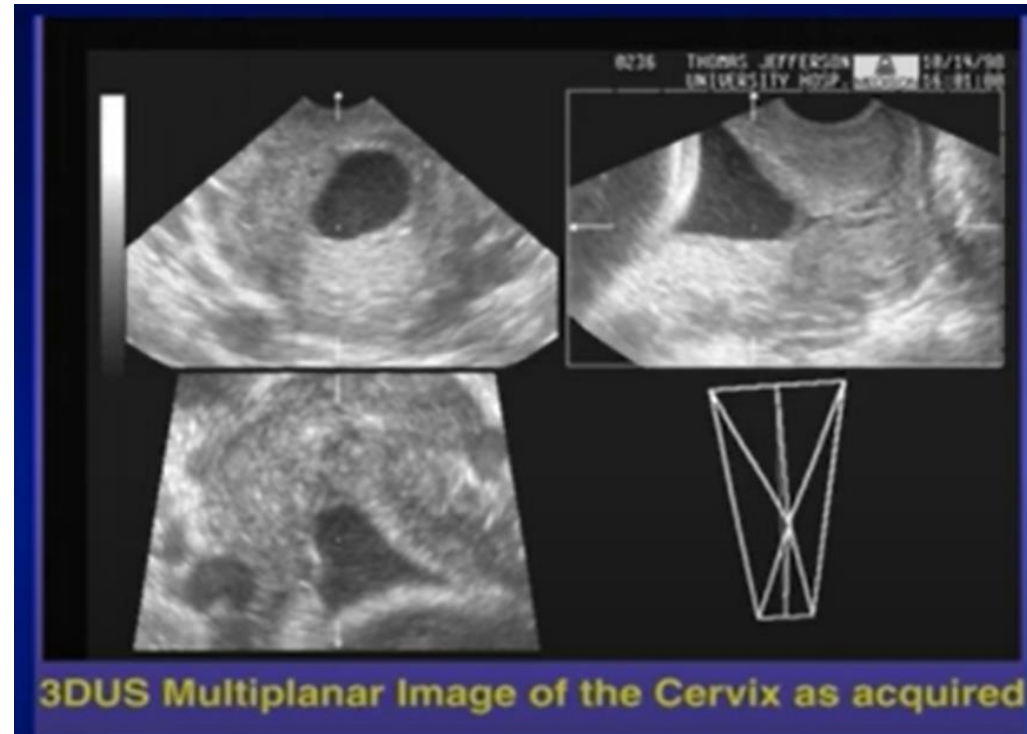
Shortening of 8-10 mm since previous TVS

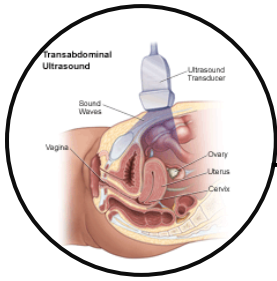
^aGestational age less than 30 weeks.



Three-dimensional sonography

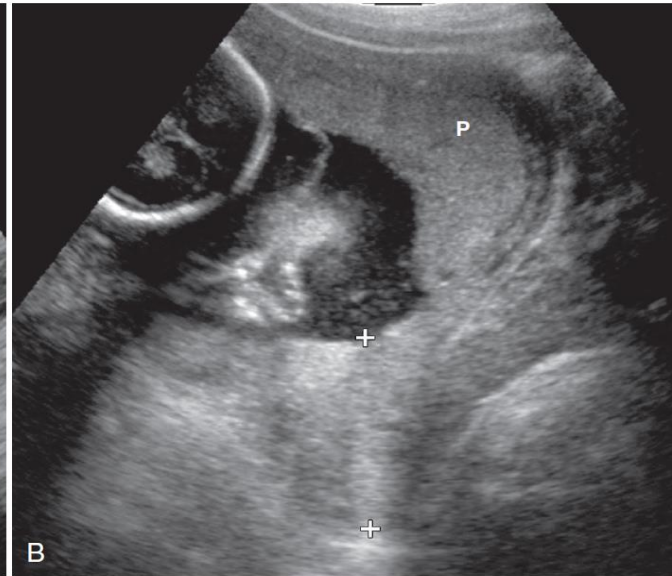
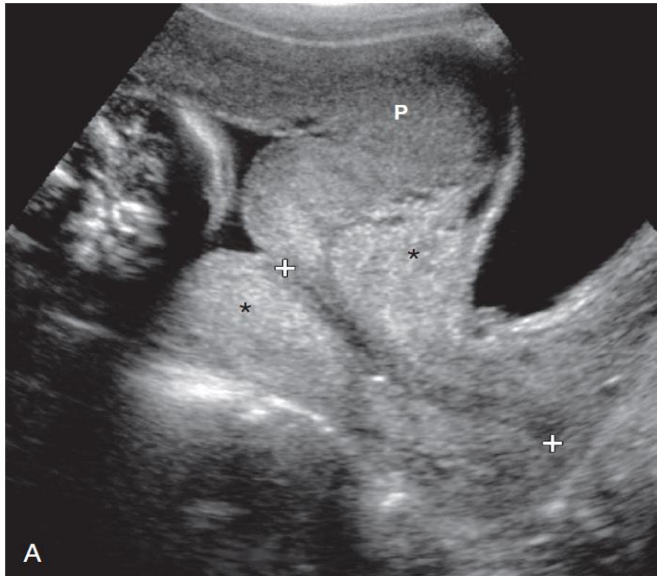
To date, TVS assessment of cervical length by **three-dimensional sonography** has been limited to the development of a normal distribution curve of cervical length through gestation. Overall, mean **cervical length appears to be longer** than the measurement by traditional two-dimensional scanning. However, there is to be **high intra/interobserver variability**. Currently, there are **no reported studies of the relationship between three-dimensional TVS and SPTB prediction**.

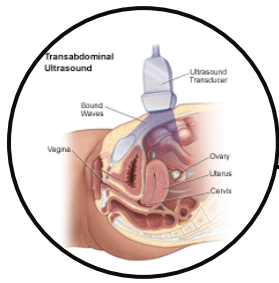




Pseudo elongation

A lower uterine segment myometrial contraction, immediately superior to the cervix, may result in a pseudoelongation of the cervix. The classic tips to recognize this appearance is the artificially **elongated length of the cervix (>5 cm)**, the thicker diameter of the “cervix” at the proximal extent, which actually incorporates the lower uterine muscle so that it appears thicker than at the external os. The thickness of the internal and external cervical os should be similar. Lower uterine segment **contractions are transient** and rarely p



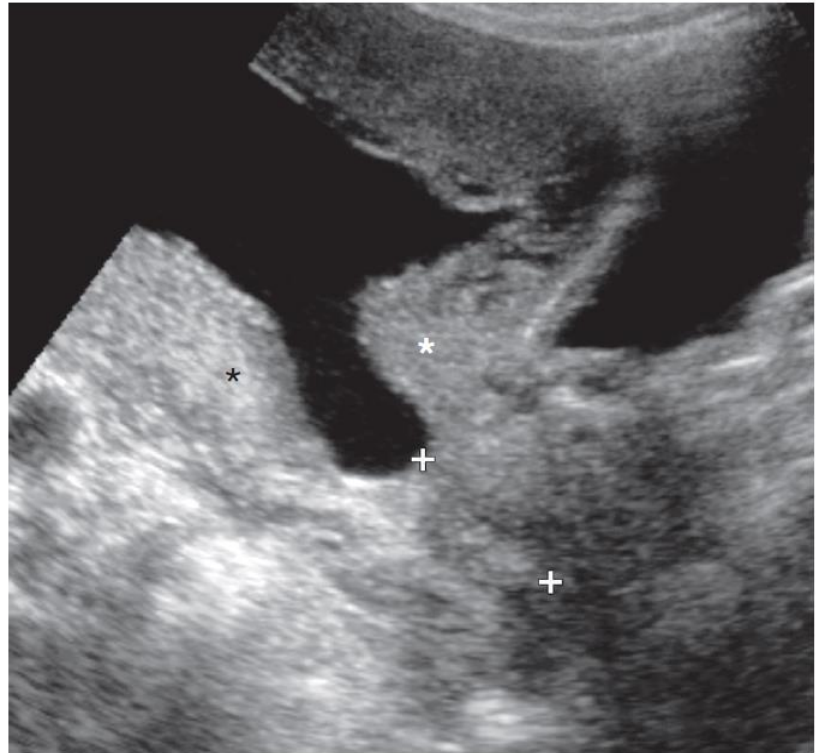


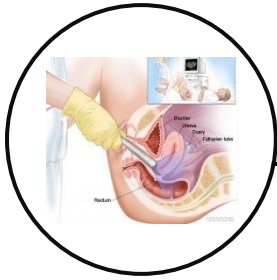
Pseudo dilation

A second pitfall associated with the lower uterine segment contraction has been termed “**pseudodilation**” of the cervix.

It is caused by a lower uterine segment contraction with partial or complete approximation of the anterior and posterior myometrium with the resultant **false appearance of a “funnel”** above the closed cervix.

The classic tips to recognize this appearance is the artificially **elongated** length of the cervix (>5 cm), the normal cervix lying caudal with respect to the pseudodilation, and the **transient** nature of this appearance.



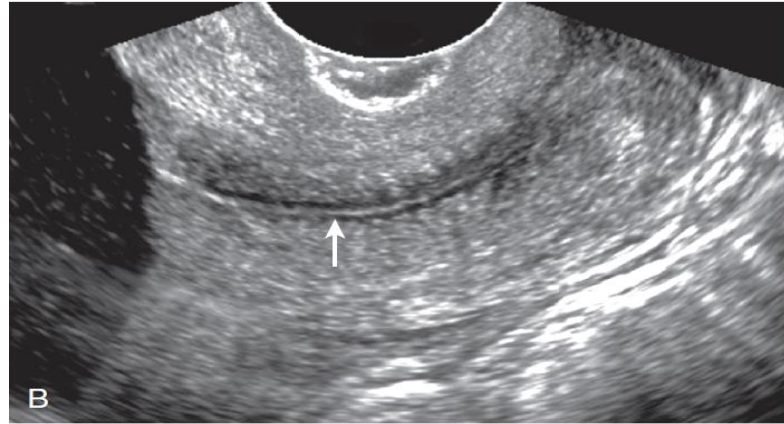


Normal cervix

Sonographically, the cervix appears as a distinct, soft tissue structure containing **midrange echoes**.

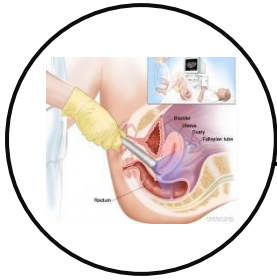
The **endocervical canal** often appears as an **echogenic line** surrounded by a hypoechoic zone attributed to the **endocervical glands**.

Occasionally, the endocervical canal may appear hypoechoic and minimally dilated along its entire length. Benign **nabothian cysts** can be seen within the cervical soft tissues.

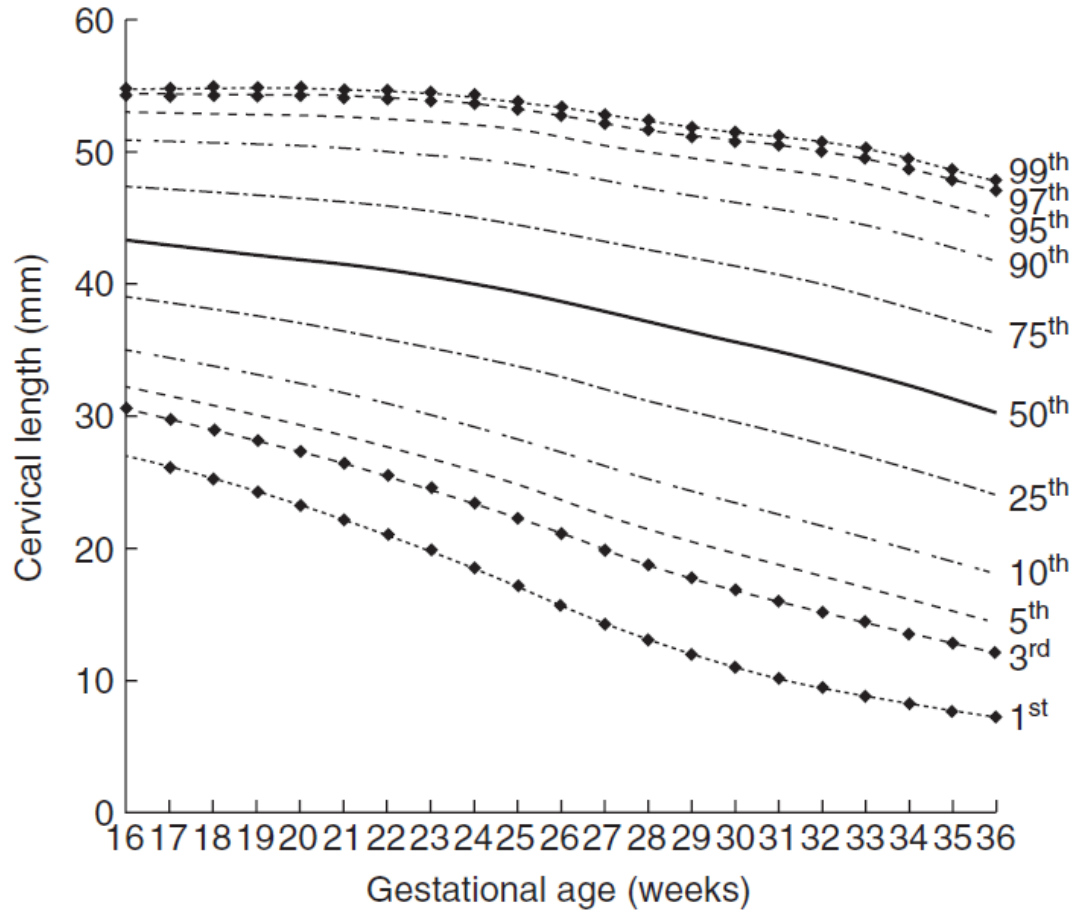


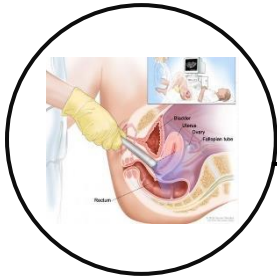
Reliability (Reproducibility) (Assuming proper technique)

- *At least 50 'practice' TVU of cervix*
- **Inter-observer variability**
 - **<10%**
- **Intra-observer variability**
 - **<10%**



Normal cervix





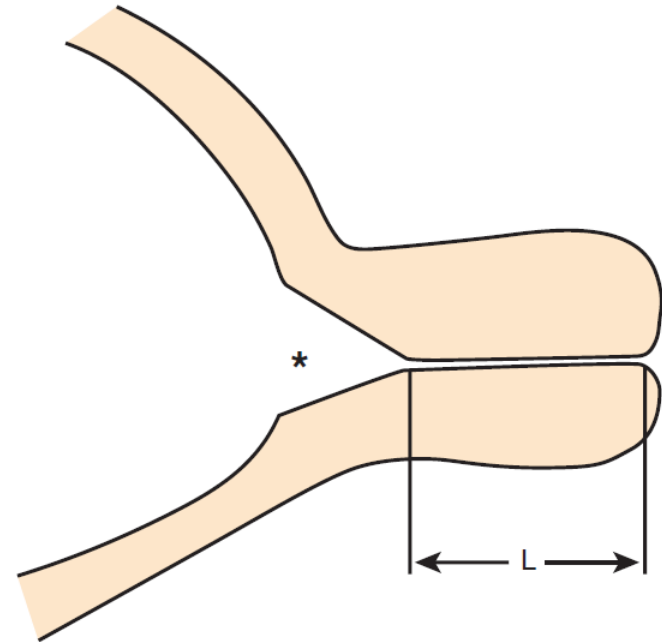
Short Cervix

The **definition**:

Less than 25 mm

or

<10th percentile length at 24-28 weeks





PREDICTION OF SPONTANEOUS PRETERM BIRTH

- **Obstetric Factors**
- **Cervical Funneling**
- **Rate of Cervical Change**
- **Dynamic Cervical Change**
- **Other Sonographic Features**



PREDICTION OF SPONTANEOUS PRETERM BIRTH

Obstetric Factors

(age, race, weight, height, smoking status, history of cervical surgery, obstetric history) and cervical length between 20 and 24 weeks' gestation for prediction of SPTB in about **59,000 women** with singleton pregnancies. The best prediction for SPTB was provided by **cervical length alone!!**



PREDICTION OF SPONTANEOUS PRETERM BIRTH

Fetal fibronectin

(FFN) is a **glycoprotein** that binds the amniochorion to the decidua and is released into **cervicovaginal fluid** in response to **inflammation** or separation of amniochorion from the decidua.

Recent studies suggest that the **combined use** of **cervical length** and FFN improves the **diagnostic performance** of each test.

|

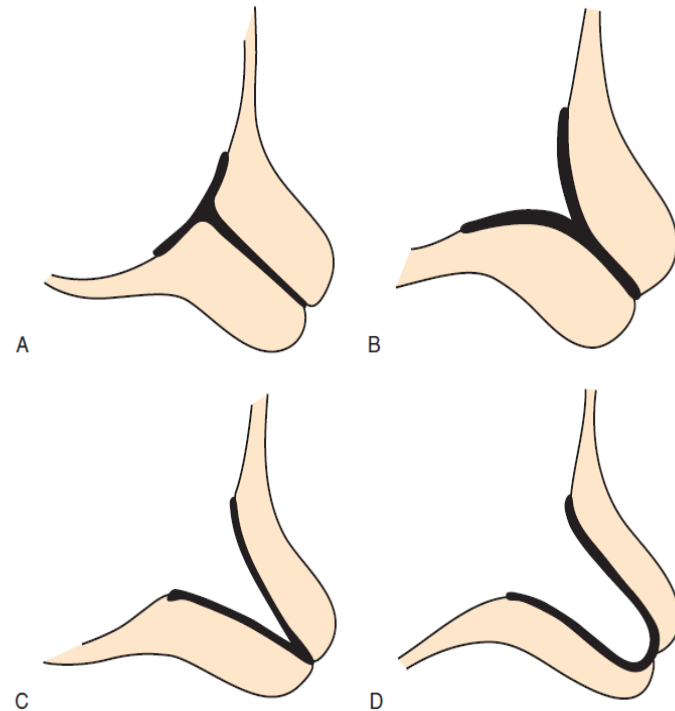


Cervical Funneling

Defined as:

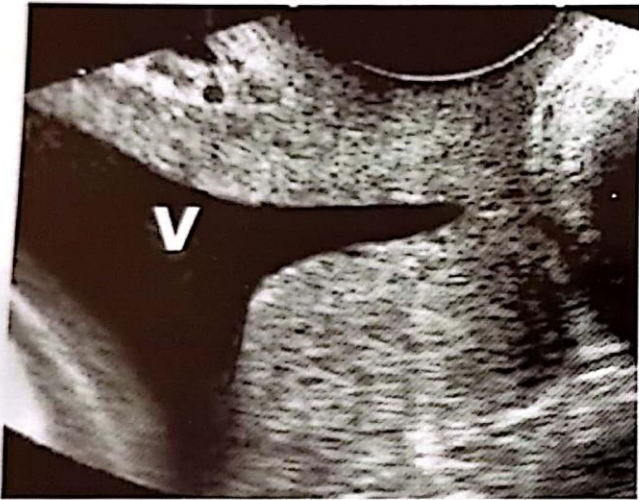
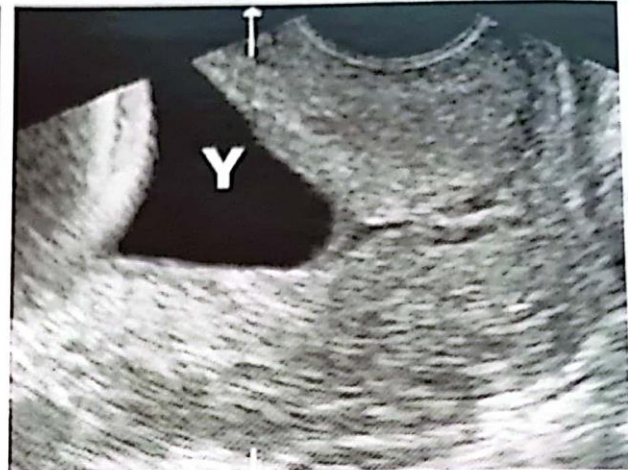
- dilation of the internal os
- & herniation of the fetal membranes into the cervical canal by more than 5 mm

Funneling of the internal os was present in **4% of all pregnancies**; the shorter the cervix was, the greater was the likelihood of funneling, **with 98% prevalence** if the length was **less than 15 mm and only 1% if greater than 30 mm**. The rate of SPTB was increased in pregnancies demonstrating cervical funneling. However, funneling did not provide any significant contribution to the prediction of SPTB when combined with cervical length. As an isolated finding compared with cervical length, the residual closed length measurements have a better predictive value than funneling. In addition, **the shape or size of the funnel was not correlated to SPTB**. As such, funneling is best reported as a categorical variable (present or absent) and best interpreted in the context of overall cervical length and obstetrical history.



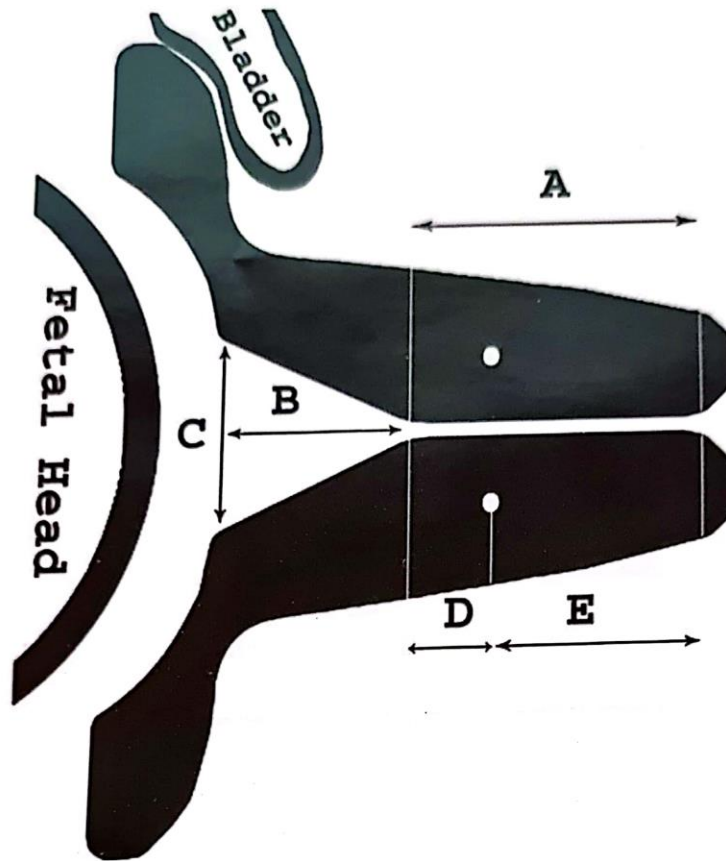


Cervical Funneling





Cervical Funneling

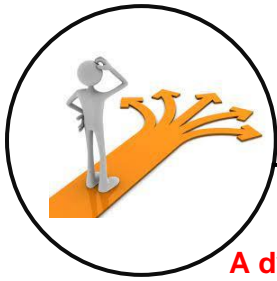




Rate of Cervical Change

Progressive shortening of the cervix may be more important than a single abnormal cervical length measurement.

A “**short and shortening**” cervical length may be a more effective tool for SPTB prediction than a “**short but stable**” cervical length at term.



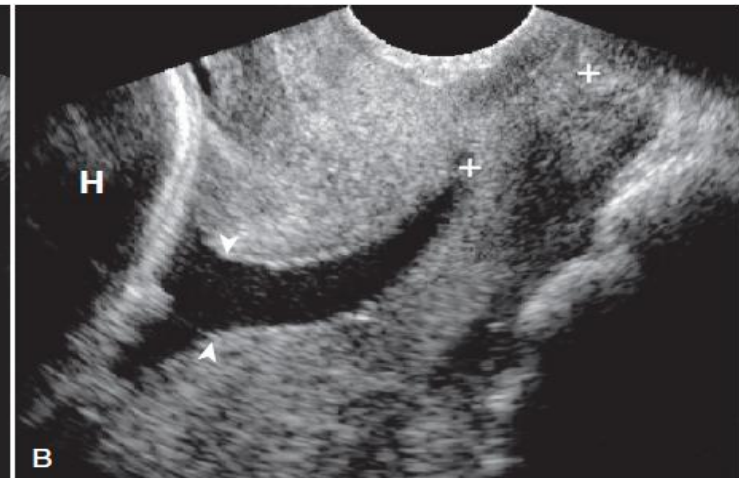
Dynamic Cervical Change

A dynamic cervix is **defined** as having **spontaneous shortening, lengthening, or funneling observed during real-time TVS**. However, the value of a dynamic cervix for the prediction of SPTB is less clearly defined than that of a short cervix.

Several noninvasive stress techniques have been suggested to elicit cervical change and improve the ability of TVS to predict cervical incompetence. These stressors include

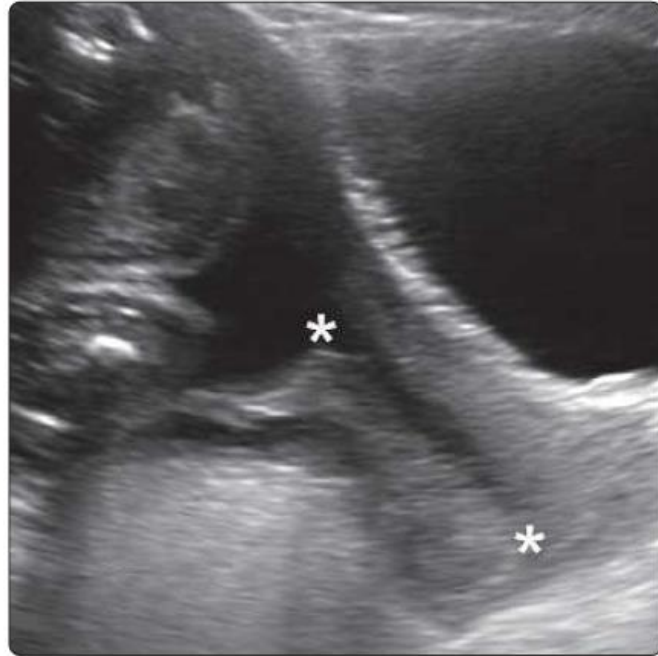
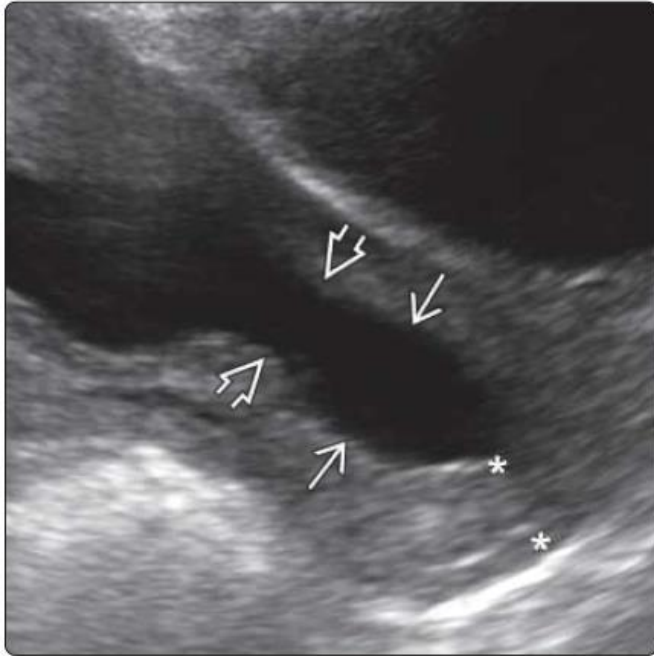
- 1 - **trans fundal pressure** (pressure applied at the fundus for **15 seconds that elicits >5 mm in cervical length shortening**),
- 2 - **standing**, and

3- **coughing**. Several small studies found that **transfundal pressure** was **the most effective tool in cervical** assessment and the most sensitive tool to predict progressive cervical shortening.





Dynamic Cervical Change





**3 – 5 Minute need to be
Cervical assessment**

RS

2D

77%

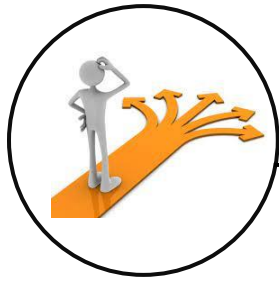
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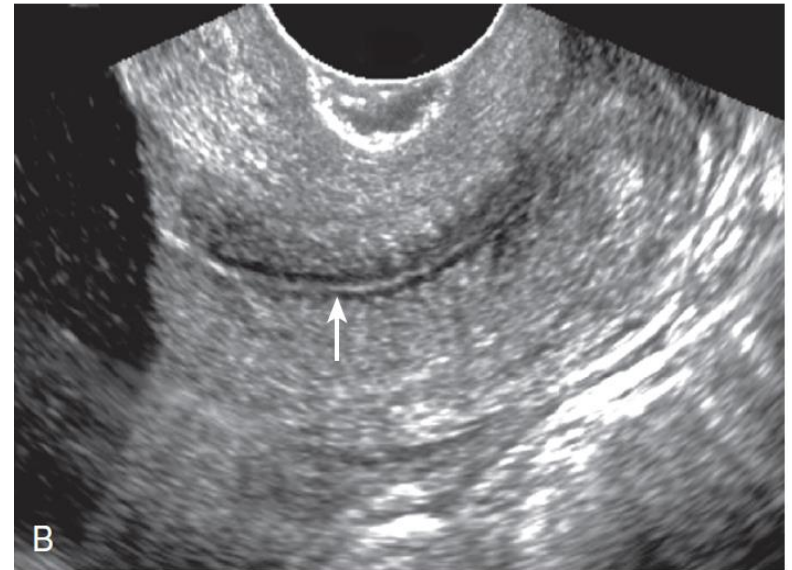




Other Sonographic Features

Several sonographic features other than cervical length have been studied to predict SPTB, including **canal dilation**, **absence of the glandular area along the length of the canal**, and **amniotic fluid debris**. Each feature is associated with an increased risk of PTB independent of cervical length. **Cervical canal dilation** of **2 to 4 mm** was associated with a 5.5-fold increased risk of SPTB.

The **cervical glandular area** is a hypoechoic zone that runs along the length of the cervical canal. In 388 unselected women, an absent cervical glandular area at 21 to 24 weeks' gestation predicted SPTB before 35 weeks suggesting a strong association.





Other Sonographic Features

“Sludge” or “debris”

the **combination** of “sludge” and a short cervix conferred a **greater** risk for SPTB than a short cervix **alone**





CERVICAL ASSESSMENT IN SPECIFIC CLINICAL SCENARIOS

- **Asymptomatic Patients**
 - *General Obstetric Population Screening*
 - *High-Risk Obstetric Population Screening:*
 - **Prior Preterm Birth**
 - **Multiple Gestations**
- **Symptomatic Patients**



CERVICAL ASSESSMENT IN SPECIFIC CLINICAL SCENARIOS

Asymptomatic Patients

- **General Obstetric Population Screening**
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 - Prior Preterm Birth
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Only about **10%** of spontaneous early PTBs occur in women with **a prior history**. This leaves approximately **90%** of PTBs occurring in women with **no prior history of PTB**, that is, the “low-risk” population. It has been shown that over **95%** of women without a prior PTB and with a singleton gestation have **additional risk factors** that would place them at **increased risk for PTB, regardless of cervical length. Therefore perhaps the term “low risk” needs to be redefined.**

During TAS for fetal anatomy or other indications, if the closed cervical length is **less than 25 mm any time before 28** weeks of gestation, or suspicion of findings such as a **dilated cervical canal**, a **ballooned fluid-filled lower segment with no visible cervix**, or a **cord or fetal part in the canal** are noted, then further evaluation of the cervix by **TVS is indicated** .

Antibiotic therapy and **bed rest** have **not** been demonstrated to be **effective** at reducing the



CERVICAL ASSESSMENT IN SPECIFIC CLINICAL SCENARIOS

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Once a patient has **experienced an SPTB**, the risk of recurrence is increased **twofold** based on **history alone**. TVS assessment of cervical length has been suggested as a tool of surveillance to evaluate the risk of SPTB specific to the individual patient and to identify those at greatest risk..



CERVICAL ASSESSMENT IN SPECIFIC CLINICAL SCENARIOS

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 - **High-Risk Obstetric Population Screening:**
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Twin and higher-order multiple gestations are at increased risk of SPTB; **50% of twin** gestations **deliver before 35 weeks** of gestation, and the mean gestational age for a **triplet** gestation is **32 weeks**.

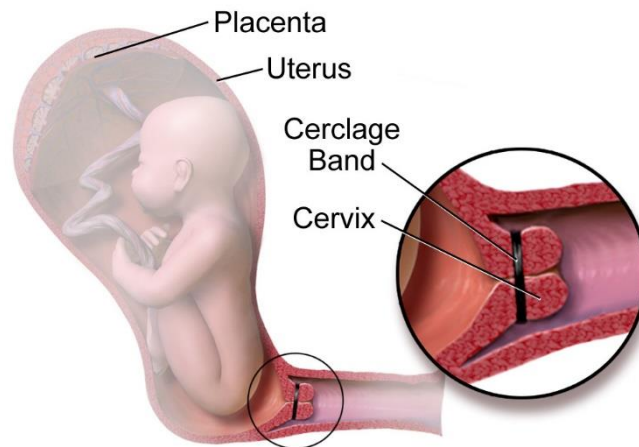


CERVICAL ASSESSMENT IN SPECIFIC CLINICAL SCENARIOS

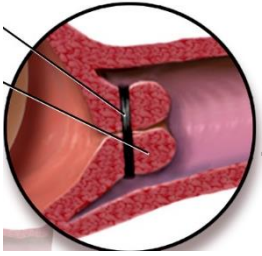
- Asymptomatic Patients
 - *General Obstetric Population Screening*
 - *High-Risk Obstetric Population Screening:*
 - Prior Preterm Birth
 - Multiple Gestations
- **Symptomatic Patients**

A patient presenting with symptoms consistent with preterm labor (**uterine contractility**, **vaginal discharge** or **bleeding**) is considered at **increased risk of SPTB**, although **two-thirds** of women admitted with the diagnosis of threatened PTB deliver at term.

Cervical Incompetence & Cervical Cerclage



Cerclage Correction of the Cervix



Cervical Incompetence and Cervical Cerclage

Cervical incompetence define:

as the **inability** to support a full-term pregnancy because of a functional or mechanical defect of the cervix

It is characterized clinically by **acute painless dilation** of the cervix usually in the mid-trimester, culminating in prolapse and/or PPRM with resultant preterm delivery. This occurs in 0.5% to 1.0% of all pregnancies, with a recurrence risk of 30%

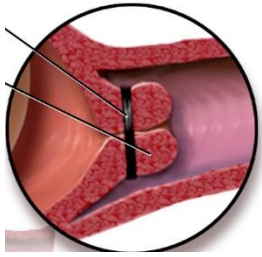
- **Functional failure** of the cervix is premature **cervical ripening** (shortening and dilation normally occurring at the end of gestation) and most often is related to urogenital or intrauterine infection or inflammation and thus has a low risk of recurrence.
- **Mechanical failure** of the cervix, **defined as a defect in the structural integrity of the cervix**, may result from traumatic injury to the cervix, including cervical laceration, amputation, conization, excessive cervical dilation before diagnostic curettage, or therapeutic abortion.² It may also be associated with DES in utero or uterine malformations. Serial cervical shortening in the second trimester and a positive response to fundal pressure may be used to unmask specific cervical mechanical incompetence during pregnancy.

Certain nonsurgical approaches, including

(activity restriction, bed rest, pelvic rest)

have **not** been proved to be effective for the treatment of cervical insufficiency.

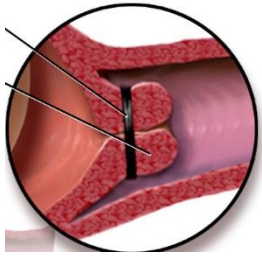
These patients may **benefit** from the placement of a **cervical cerclage**, a suture used to reinforce the structural integrity of the cervical canal.



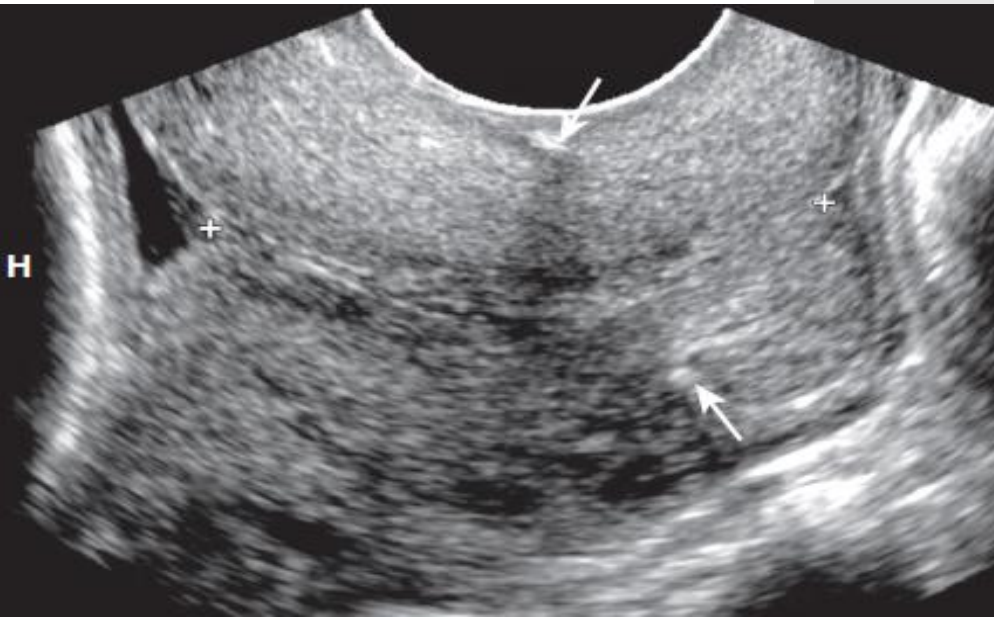
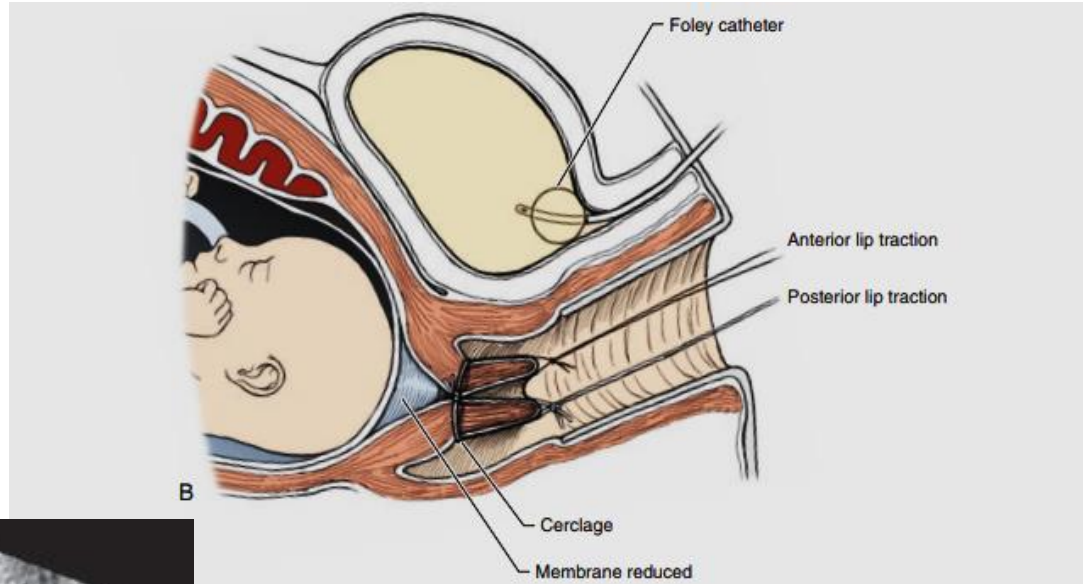
Cervical Incompetence and Cervical Cerclage

Indication of cerclage

- **History indicated (prophylactic) cerclage**: in patients with unexplained second-trimester delivery in the absence of labor or abruptio placentae. Three randomized controlled trials have reported on the efficacy of this approach; two found no significant improvement in outcomes and one found fewer preterm deliveries before 33 weeks in the cerclage group.
- **Physical examination indicated (“rescue”) cerclage**: in patients presenting with advanced cervical dilation in the absence of labor or abruptio placentae. Limited data from one small randomized trial and retrospective studies have suggested the possibility of benefit from cerclage placement in these women.⁸³
- **Sonographic finding** of a short cervix (<25 mm) before 24 weeks of gestation in patient with singleton pregnancy and prior history of PTB less than 34 weeks of gestation.

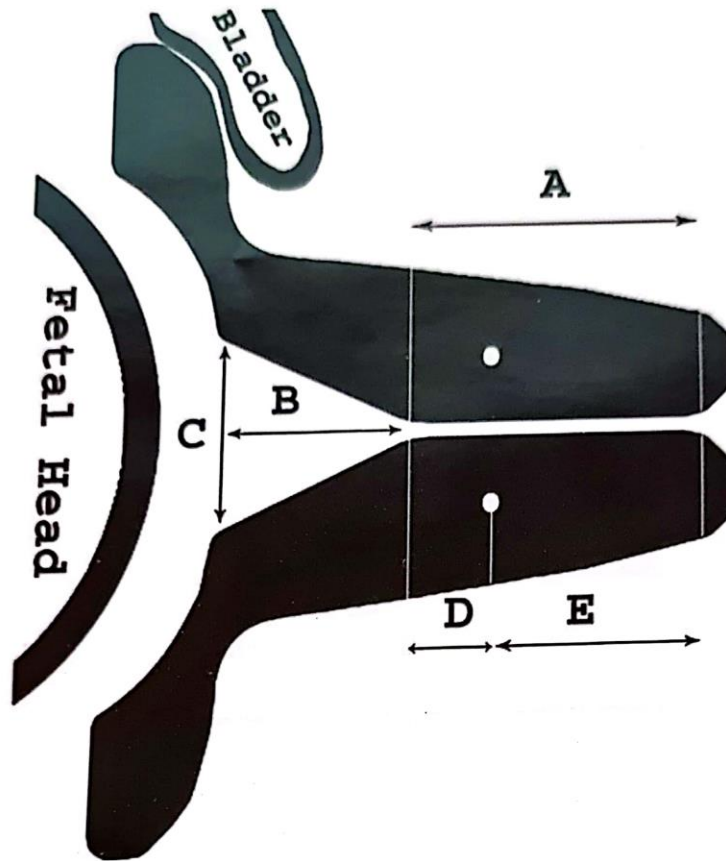


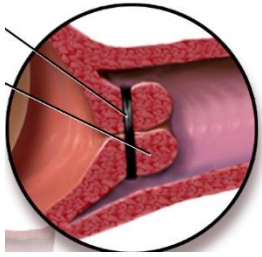
Cervical Cerclage



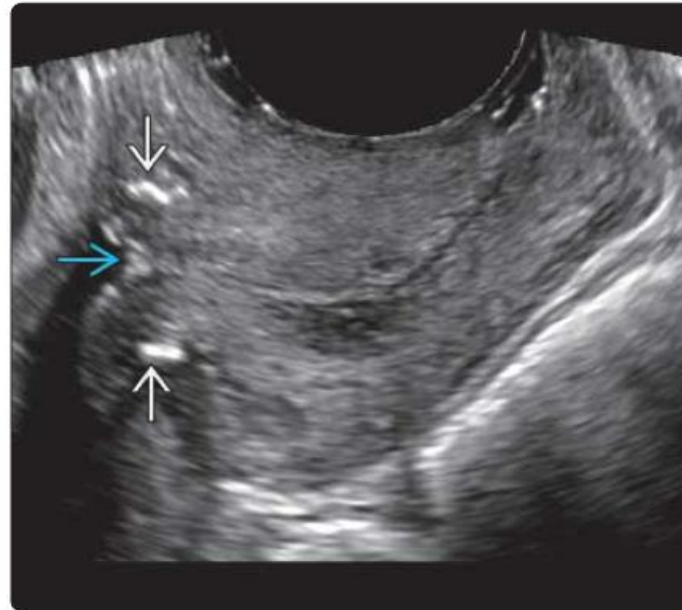
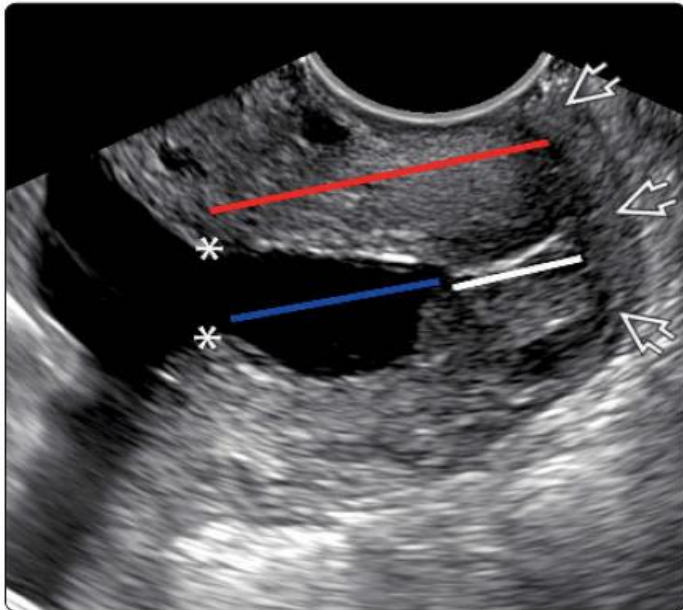
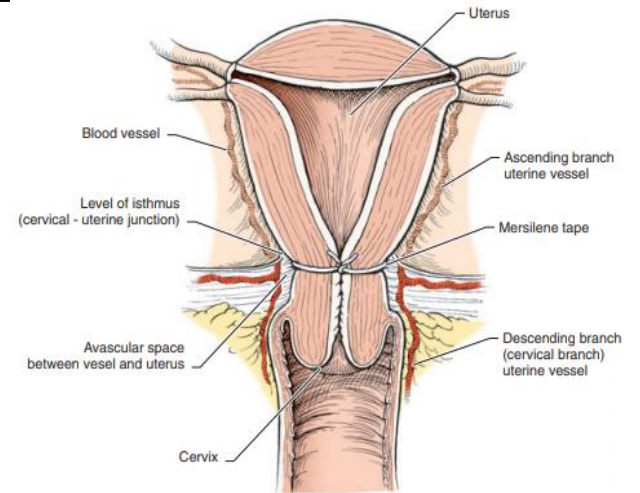


Cervical Cerclage





Abdominal Cerclage



*Thanks for
your attention*

