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## Current options for mechanical prevention of preterm birth

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### ABSTRACT

Cervical insufficiency can be defined by a combination of obstetric history, cervical dilation on exam, and/or short cervical length in women with prior preterm birth. Options for mechanical intervention include cerclage and pessary. There is evidence to support the benefit of a cervical cerclage in women with singleton gestations who have a diagnosis of cervical insufficiency either based on second trimester painless cervical dilatation leading to recurrent early preterm births, or a history of early spontaneous preterm birth and a second trimester transvaginal ultrasound short cervical length or cervical dilation on exam. For women with multiple gestations, the benefit of a cerclage is uncertain, and further study is warranted. The pessary has also been studied for mechanical prevention of preterm birth in various populations, however the results so far have been mixed and warrants further study prior to routine use.

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### Introduction

Cervical insufficiency, formerly called cervical incompetence, represents a condition usually defined as painless cervical dilatation leading to recurrent second trimester pregnancy losses. Cervical ‘incompetence’ implies a dichotomous state of either ‘competent’ or ‘incompetent,’ however studies over the past decade have revealed that there is more likely a continuum of cervical insufficiency resulting in a variable risk of preterm birth/second trimester loss depending on specific characteristics of the cervix, most notably, cervical length.<sup>1,2</sup>

Because cervical insufficiency has been thought to be mostly related to a mechanical problem with the cervix, the approach to address cervical insufficiency has also been mechanical—either with a cerclage or pessary. High quality evidence on the use of cerclage for preterm birth prevention has been published, with over 20 randomized controlled trials (RCTs) on cerclage.<sup>3–6</sup> The pessary, a silicone device meant to

support the cervix by reducing direct pressure from the uterus on the cervical canal, is another method that has been studied in RCTs in different pregnant populations.<sup>7,8</sup> The purpose of this article is to review the evidence and guidelines for options for mechanical prevention of preterm birth.

It should be noted that while this article addresses mechanical prevention, in addition to these mechanical methods, certain populations should also be concurrently treated with progesterone therapy, as described in the article “Progesterone and Preterm Birth.”

### Historical perspective

The concept of cervical insufficiency is centuries old, first mentioned in 1658 as a cervix “so slack it cannot rightly... keep in the seed”.<sup>9</sup> In the early twentieth century, obstetricians began to delineate the anatomy of the uterus and cervix

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in pregnancy and identify cervical insufficiency primarily as a consequence of prior obstetrical trauma.<sup>10</sup>

Mechanical prevention of preterm birth is not a new concept. Cervical cerclage has been used for over 50 years for the purpose of prolonging pregnancy and preventing preterm birth. Shirodkar<sup>11</sup> first published a technique of forming a purse string around the internal os in order to treat “incompetence of the internal os” in women with a history of recurrent second trimester loss. Later McDonald published a slightly different technique for the same purpose in women presenting with bulging membranes.<sup>12</sup> A recent study in the United States estimated that the incidence of cerclage in pregnancies resulting in a live birth is between 0.3% and 0.4% over the past decade.<sup>13,14</sup>

The cervical pessary is another method that has been studied for preterm birth prevention. One of the earliest reports of pessary use for preterm birth prevention were case series in 1959 and 1961.<sup>15,16</sup> The most commonly studied pessary now is the Arabin pessary.<sup>17</sup> The mechanism of action of the pessary is thought to be through the posterior deviation of the cervix and subsequent redistribution of the pressure from the uterus. The potential benefit of the pessary is avoiding a surgical procedure with its associated risks in the second trimester of pregnancy.

## Diagnosis of cervical insufficiency

Cervical insufficiency has been variably defined.<sup>18</sup> Here we dissect the definition of cervical insufficiency in the following three ways: obstetric history, physical exam in the current pregnancy, and transvaginal ultrasound cervical length in the current pregnancy. Although evaluation of the cervix outside of pregnancy to assess for cervical insufficiency has been studied,<sup>19</sup> there is currently no clinically useful test that can be recommended.

### Obstetric history

Obstetric history indicative of cervical insufficiency is a history of recurrent second trimester loss, preceded by painless cervical dilation. Painless cervical dilation is defined by cervical dilation in the absence of contractions, labor, ruptured membranes, infection, or other clear pathology.

### Physical exam

A patient presenting with painless cervical dilation in the second trimester is also suggestive of cervical insufficiency.

### Transvaginal ultrasound cervical length (during pregnancy)

A short transvaginal ultrasound cervical length in the second trimester is associated with an increased risk of preterm delivery and may be a precursor to cervical insufficiency. Short cervical length is thought to be on the continuum of cervical insufficiency and a precursor to preterm labor and delivery.<sup>1,2</sup> This risk varies by obstetric history. Patients without a history of spontaneous preterm birth or second trimester loss, and a cervical length  $\leq 25$  mm have about a 30–

40% risk of preterm delivery ( $<37$  weeks).<sup>20,21</sup> Patients with a history of a prior spontaneous preterm delivery  $<34$  weeks and a second trimester transvaginal ultrasound cervical length  $<25$  mm have ~60% risk of preterm delivery.<sup>21</sup> Given the significantly increased risk of preterm delivery in women with a short cervix and prior preterm birth, another potential definition of cervical insufficiency is a transvaginal ultrasound cervical length  $<25$  mm prior to 24 weeks in a woman with a prior spontaneous preterm birth.<sup>22</sup>

The technique for transvaginal ultrasound cervical length measurement has been described previously<sup>23</sup> and there is an educational/certification program available through the Perinatal Quality Foundation to ensure accurate cervical length measurement (<https://clear.perinatalquality.org/default.aspx>).

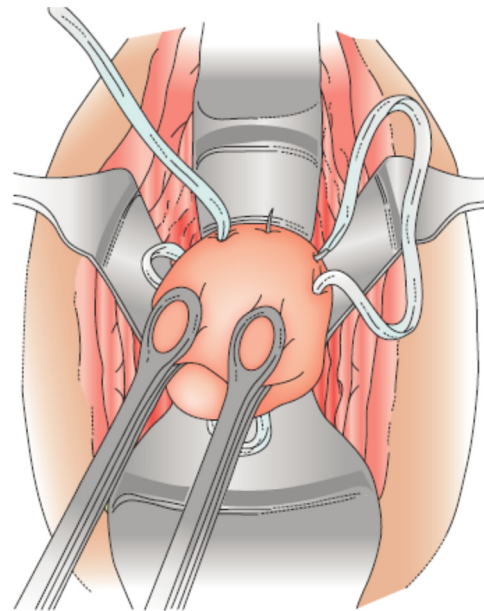
## Indications for cerclage in singleton pregnancy

Because cervical insufficiency is thought to be a mechanical or structural deficiency of the cervix, a cerclage has been hypothesized to buffer against that deficiency (Fig). Studies have found variable benefit for cerclage depending on patient selection. Here we summarize the three main indications for cerclage in singleton pregnancies: obstetric history, transvaginal ultrasound cervical length, and physical exam. Cerclage in twins or higher order gestations is addressed later in this article.

### History-indicated

#### Definition

A cerclage placed due solely to obstetric history and not current pregnancy characteristics.



**Fig. – Example of a McDonald Cerclage. Just distal to the vesico-cervical reflection a purse string suture is placed in four to six passes circumferentially around the cervix. Reproduced with permission from Boelig and Berghella.<sup>34</sup>**

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