

# A Review of the Applications of Intraoperative Ultrasound Guidance in Cervical Cerclage and Selected Gynecological Procedures

Noa Leybovitz-Haleluya, MD<sup>1,\*</sup>, Reli Hershkovitz, MD, PhD<sup>1</sup>

<sup>1</sup>Department of Obstetrics and Gynecology, Soroka University Medical Center, Ben-Gurion University of the Negev, Beer-Sheva, Israel

\*Correspondence should be addressed to Noa Leybovitz-Haleluya, Sagithaleluya@gmail.com

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## Abstract

**Introduction:** Many gynecologic procedures may benefit from the use of real-time ultrasonography. The goal of this review is to summarize the use of ultrasound in some of the main gynecologic procedures, with focus on cervical cerclage procedure.

**Recent findings:** Ultrasound guidance has been shown to decrease both operative time and complication rates in curettage procedures. In addition, intraoperative ultrasound use reduces recurrence rates after hysteroscopic resection of uterine myoma or septa. Ultrasound guidance may improve the efficiency of cervical cerclage by direct visualization of tightening and assist in measures of prognostic factors following the procedure.

**Conclusion:** Intraoperative ultrasound guidance appears to be a safe and valuable tool for the gynecologic surgeon. It may reduce complication and re-operation rates and may improve the efficacy of some procedures.

**Keywords:** Curettage, Cerclage, Hysteroscopy, Intraoperative ultrasound

## Introduction

The role of ultrasound (US) in gynecological procedures is increasing. Transabdominal ultrasound image-guided intrauterine procedures are not new. In this article, we reviewed the use of ultrasound some of the main gynecological procedures, focusing on the cerclage procedures.

### Use of US in Dilatation and Curettage Procedures

Over 50 million dilation-and-curettage (D&C) procedures are performed worldwide each year. Thus, the safety of this procedure is an important global health issue. Goldenberg et al reported using transabdominal ultrasound guidance in D&C procedures [1]. The US guidance is performed to safeguard the uterus from trauma with an advantage of clearing and delineating the endpoint of the procedure.

One randomized study investigated whether or not

continuous ultrasound guidance improved outcome for first-trimester termination of pregnancy [2]. 230 women were randomized to D&C with or without US guidance. Using US guidance resulted in significantly lower overall complication rate than the procedure performed without US guidance. Intraoperative US was associated with a reduction in intraoperative and postoperative blood loss, procedure time, analgesic requirement, and convalescence time, as well as lower re-operation and infection rates.

Timor-Tritsch et al. have described the performance of D&C under direct vision via transvaginal ultrasound-assisted gynecologic surgery system allowing a single individual to control the US while performing the surgical procedure [3].

### Use of US in Hysteroscopic Procedures

Use of US has recently been introduced as an adjunct to operative hysteroscopy. With a full bladder, conventional

abdominal ultrasound transducers can provide uterine assessment without the need for concomitant laparoscopy. The surgeon is able to visualize instruments as they enter the uterus, decreasing the risk of uterine perforation during dilation. Improved visualization of the myometrial limits can also help avoid uterine perforation.

Previous studies described hysteroscopic procedures that were performed under transabdominal US guidance without any complications [4]. A case-control study compared US with laparoscopic guidance during hysteroscopic resection of uterine septa and myoma. Eighty-one patients underwent hysteroscopy with US guidance compared to 45 control patients who underwent the procedure with laparoscopic guidance. Ultrasound guidance allowed complete resection in all cases without higher risk of complications [5].

### Use of US in Cervical Cerclage Procedures

The American College of Obstetricians and Gynecologists' definition of cervical insufficiency is "the inability of the uterine cervix to retain a pregnancy in the second trimester in the absence of clinical contractions, labor, or both" [6]. The diagnosis of cervical insufficiency can be history-based with  $\geq 2$  consecutive prior second-trimester pregnancy losses or extremely preterm births prior to 28 weeks, associated with no or minimal symptoms, or the diagnosis can be ultrasound-based with cervical length of  $\leq 25$  mm before 24 weeks [7].

The treatment of choice for patients with cervical insufficiency is cervical cerclage [8,9], despite the paucity of data from randomized trials proving its efficacy. In a 2017 meta-analysis of randomized trials of cerclage versus no cerclage in singleton pregnancies at high risk of pregnancy loss based on history or ultrasound findings, placement of a cerclage reduced preterm birth  $<34$  weeks (18 versus 24 percent; risk ratio 0.77, 95% CI 0.66-0.89) [10].

Most cerclages are placed via a transvaginal approach. The transabdominal approach is more invasive but allows higher placement at the cervicoisthmic portion of the uterus, while transvaginal cerclages are generally placed distal to the internal os.

The two most common transvaginal techniques for cerclage were described by Shirodkar and McDonald. The Shirodkar cerclage is placed as close as possible to the level of the internal os after surgically reflecting the bladder and rectum, whereas the McDonald cerclage is a purse-string suture that does not involve dissection. The data exist showed no significant differences in pregnancy outcome between the two procedure [11-13].

The primary technical goal of cerclage placement is to reinforce the cervix at the level of the internal os; lengthening

the cervix is a secondary benefit [14,15]. In one study, after cerclage placement, longer upper cervical length, but not total cervical length, correlated with birth after 28 and after 32 weeks of gestation [16].

The exact force needed to tie the suture is unknown and depends upon surgeon's experience. Alterations in the force applied may be a possible explanation for the failure of cerclage in some cases. Intraoperative US can be helpful for visualizing the site of the suture relative to the internal os, maternal bladder, and rectum [17].

In the past, Fleischer et al. and Ludmir et al. described the performance of transvaginal cerclage under US guidance in cases of cervical conization and cervical hypoplasia [17-19]. However, these studies consisted of small number of patients.

Hershkovitz et al. demonstrated in a prospective study direct sonographic visualization of the tightening of the suture. formation of an hourglass cervical canal during the procedure was associated with higher rates of preterm delivery [20].

These studies demonstrate the potential added clinical value of US in cerclage procedures. However, further comparative studies are warranted comparing procedures with or without US use, focusing on time of procedure, efficiency, complication rates, and surgeon satisfaction.

Cervical length in US following cerclage is a prognostic factor of preterm delivery. Miller et al. studied 124 women treated with elective cerclage and found a significant relationship between a cervical length of less than 25 mm measured between 18 and 24 weeks and delivery before 34 weeks [21]. Borghi et al. studied the use of 3D transvaginal US in women treated with cerclage and demonstrated significant relationship between a second trimester cervical volume  $< 18.17$  cm<sup>3</sup> and an earlier delivery [22].

### Conclusion

Intraoperative US may improve the efficacy of some procedures, allow completion of technically difficult procedures, reduce the risk of re-intervention, and minimize complications. US guidance appears to be a safe and valuable tool. Further prospective comparative studies are needed in order to highlight the efficacy of US use in cerclage procedures, as well as its effect of complications rates.

### Conflict of Interest

The authors report no conflict of interest.

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