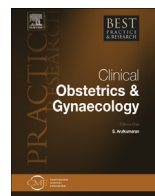




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# Morcellation complications: From direct trauma to inoculation

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Morcellation is the fragmentation of tissue to facilitate removal of the specimen through small incision in minimally invasive surgery. This technique is not unique to gynecology and is used in general surgery with the goal of improved surgical outcomes including decreased pain, cost, hospital length of stay, and rapid return to normal activities and work. Gynecologic laparoscopic power morcellation (LPM) has come under increased scrutiny over the last 2 years due to widespread attention to a known but rare complication, an unanticipated dissemination of malignancy, namely occult uterine leiomyosarcoma. This chapter focuses on complications associated with gynecologic tissue morcellation from inoculation of benign or malignant tissue fragments within the peritoneal cavity and direct trauma from morcellation techniques. We also include a review of the various morcellation techniques from knife to electrical and the use of intraperitoneal specimen containment systems.

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## Introduction

Morcellation has been used for over 20 years to facilitate removal of tissue specimen through small incisions in minimally invasive surgery. Minimally invasive gynecologic surgery refers to vaginal,

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conventional laparoscopic, and robotic-assisted laparoscopic surgery. Techniques for tissue extraction were first developed in the early 1990s. Dr. Semm and his colleagues from Germany first described a manual tissue punch device in 1991 [2]. In 1993, Dr. Steiner and colleagues from Switzerland described the first “electrical cutting device” for laparoscopic specimen removal [3]. This article in which electromechanical morcellation was introduced also provides a summary of the other specimen removal techniques, some of which are still in use today such as transvaginal extraction either via the vagina or posterior colpotomy, minilaparotomy, and, less commonly, via trocar with “powerful forceps.” [3] The electromechanical or “power” morcellator was approved by the Food and Drug Administration in 1991 for all tissues, 1995 for gynecologic procedures, and 2000 for hysterectomy (510Ks K910939, K946147, K993801).

Over 15 years later, much attention has been paid to laparoscopic power morcellation (LPM) following a widely publicized incident of iatrogenic morcellation of occult leiomyosarcoma in a 40-year-old woman with suspected uterine fibroids [4]. Complications associated with tissue morcellation include risk of dissemination of benign and malignant tissue as well as direct trauma from instrumentation such as the scalpel or electromechanical morcellation.

## Technique

Mode of surgery, surgeon comfort, specimen size, and clinical characteristics and preference of the patient are all factors to be considered while determining the route and technique of specimen removal.

### *Vaginal specimen removal*

Candidates for vaginal specimen removal include women undergoing vaginal or total laparoscopic hysterectomy, and pelvic organ prolapse and prior vaginal birth are other factors to be considered for ease of specimen removal. Similarly, patients undergoing myomectomy with similar descensus may benefit from posterior colpotomy for vaginal specimen removal. In the case of a total hysterectomy, the uterus may be removed intact vaginally or using various morcellation techniques from coring, bivalving with a knife to electromechanical morcellation.

Electromechanical morcellation via the vagina has been explored; however, proximity to the bowel and bladder and decreased visualization vaginally make this a procedure to be used only by highly experienced pelvic surgeons. Posterior colpotomy involves a horizontal incision between the uterosacral ligaments in the posterior cul-de-sac. The size of the incision depends on the size of the specimen and the amount of space afforded by the patient's anatomy. Both the vaginal cuff and the posterior colpotomy can be closed either laparoscopically or vaginally. Transcervical morcellation is another method of vaginal specimen removal performed in the setting of supracervical hysterectomy using a 15-mm classic intrafascial supracervical hysterectomy (CISH) instrument to core the cervix [5].

### *Abdominal specimen removal*

Abdominal specimen removal can be performed in a minimally invasive fashion using a laparoscopic power morcellator in select patients or with knife morcellation via a minilaparotomy. A minilaparotomy is not well defined in the literature but typically involves extension of a preexisting trocar site, either at the umbilicus or suprapubically. The incision typically ranges 3–4 cm in length.

Various techniques have been published in recent months to present a systematic way to safely and efficiently remove a specimen using a knife. One such technique named “Extracorporeal C-Incision Tissue Extraction” or “ExCITE” uses an 11-blade scalpel to create a C-shaped, curvilinear incision. This method preserves a continuous serosa to mimic the technique used during LPM to create long strips of tissue [6]. The video of the technique has been provided.

### *Specimen containment systems*

Containment systems for both vaginal and abdominal specimen removal have been developed. The general principle is to place the intact specimen into a bag and perform the appropriate morcellation technique within the bag to contain the tissue fragments and prevent inadvertent dissemination of

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