

Review Article

# Electric Morcellation-related Reoperations After Laparoscopic Myomectomy and Nonmyomectomy Procedures

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**ABSTRACT** **Study Objective:** To identify, collate, and summarize the most common causes and pathologies of electric morcellation-related reoperations after laparoscopic myomectomy and nonmyomectomy procedures.

**Design:** A systematic review of published medical literature from January 1990 to February 2014 reporting morcellation-related reoperations after laparoscopic myomectomy and nonmyomectomy procedures involving the use of intracorporeal electric tissue morcellators. Publications were included in this review if patients underwent a second surgical procedure because of the onset of new clinical symptoms after a primary surgical procedure that involved intracorporeal morcellation or if histopathology of the morcellated surgical specimen revealed malignancy (Canadian Task Force classification II-3).

**Setting:** All case reports and case series were reported from community and academic hospitals in the United States and the rest of the world.

**Patients:** We identified 66 patients from 32 publications.

**Interventions:** Reoperation after laparoscopic myomectomy and nonmyomectomy procedures involving intracorporeal electric tissue morcellation.

**Measurements and Main Results:** For patients who presented with new clinical symptoms requiring reoperation, we recorded the follow-up period, nature and duration of the new symptoms, details of the second surgical procedure, intraoperative findings during the second surgical procedure, and the final histopathologic diagnosis. When histopathology of the morcellated specimen revealed malignancy, we recorded the specific type of malignancy, the corresponding surgical treatment that the patient underwent, and the follow-up period. Percentages and 95% confidence intervals were calculated for all categorical variables. Twenty-four (36.4%) patients underwent laparoscopic myomectomies, of which 19 (79.2%) and 5 (20.8%) patients required a second surgical procedure because of new clinical symptoms and the diagnosis of malignancy in the morcellated surgical specimen, respectively. Forty-two (63.6%) patients underwent laparoscopic hysterectomies; of these, 25 (59.5%) patients required a second surgical procedure because of the onset of new clinical symptoms, whereas the remaining 17 (40.5%) patients underwent a second surgical procedure because of the diagnosis of malignancy in the morcellated surgical specimen. The most common benign pathology was parasitic leiomyomata (22 patients, 33.3%). The most common malignant pathology was leiomyosarcoma (16 patients, 24.2%).

**Conclusion:** Dispersion of tissue fragments into the peritoneal cavity at the time of morcellation continues to be a concern. It was previously thought that morcellated tissue fragments are resorbed by the peritoneal cavity; however, there is some evidence highlighting the long-term sequelae related to the growth and propagation of these dispersed tissue fragments in the form of parasitic leiomyomata, iatrogenic endometriosis, and cancer progression. Yet, the majority of laparoscopic myomectomy and nonmyomectomy procedures involving the use of intracorporeal electric tissue morcellators are uncomplicated, and institutions having no women with endometriosis or cancer are very

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unlikely to report surgical outcomes of uneventful electric morcellation. Thus, prospective studies are still required to validate the role of electric intracorporeal tissue morcellation in the pathogenesis of parasitic leiomyomata, iatrogenic endometriosis, and cancer progression. *Journal of Minimally Invasive Gynecology* (2015) 22, 163–176 © 2015 AAGL. All rights reserved.

**Keywords:** Complications; Hysterectomy; Laparoscopy; Morcellation; Myomectomy; Reoperation

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Gynecologic surgery has truly become minimally invasive because of the refinement of laparoscopic techniques and instrumentation. Large uteri or leiomyomata that were previously removed through laparotomy are now morcellated, facilitating removal through smaller incisions [1]. The first documented uterine morcellation procedure was performed in 1840 by Ammasut of France to deliver a leiomyomatous uterus through the vagina [2]. In 1899, William Pryor of New York described the systematic technique of transvaginal wedge morcellation of enlarged uteri [1]. After several variations of hand morcellation and the success of laparoscopic hysterectomies in the early 1990s, Steiner et al [3] developed a prototype electrical morcellator that could be used during laparoscopic surgery. This morcellator consisted of a 12-mm cylindrical sheath with a rotating blade at its intra-abdominal end and an electrical microengine at the other end. Cylindrical blocks of tissue were cut out of the original surgical specimen and removed from the peritoneal cavity through the instrument using grasping forceps [3]. Although modern morcellators are variations of Steiner et al's original design consisting of a sheath, grasper, and cutting blade that produces cores of tissue that can be retrieved through smaller incisions, the most recent morcellator uses bipolar energy to cut tissue instead of a blade [2].

The newer and easier-to-use electric morcellators have contributed to the rise in number of hysterectomies and myomectomies performed via the laparoscopic approach; however, some morcellators have been associated with injury to the abdominal and pelvic organs at the time of morcellation [4–6]. A recent review by Milad and Milad [6] identified 55 morcellator-related injuries over the past 15 years. These injuries involved the bowel, bladder, kidney, ureters, and the diaphragm [6]. Eleven injuries involved more than 1 organ, and 6 deaths were directly attributed to morcellator-related injuries [6].

Another growing concern of morcellation involves dispersion of morcellated tissue fragments into the peritoneal cavity at the time of morcellation. There are several publications linking the pathogenesis of parasitic leiomyomata, iatrogenic endometriosis, and disseminated peritoneal leiomyomatosis (DPL) to morcellator-related surgical spillage and dispersion of tissue fragments in the peritoneal cavity [4,5,7–10]. More importantly, morcellation of surgical specimens containing occult malignancy can lead

to seeding of cancerous tissue in the abdominal and pelvic cavity, possibly leading to decreased cancer survival [7–10].

Although morcellation-related complications are becoming more frequently reported, systematic data summarizing the most common causes or pathologies of morcellation-related reoperations during laparoscopic myomectomy and nonmyomectomy procedures remain scarce. The primary objective of this systematic review is to identify, collate, and summarize the most common causes and pathologies of morcellation-related reoperations after laparoscopic myomectomy (LM), laparoscopic supracervical hysterectomy (LSCH), and total laparoscopic hysterectomy (TLH) involving the use of electric intracorporeal tissue morcellation.

## Materials and Methods

### Inclusion Criteria

We searched PubMed, Ovid, EMBASE, and Google Scholar for all English language peer-reviewed publications published from January 1990 to February 2014 with the search terms "uterine morcellation," "complications," "laparoscopy," "myomectomy," and "hysterectomy." We also searched the US Food and Drug Administration's Manufacturer and User Facility Device Experience database with search terms "morcellation," "complications," and "adverse events." The authors independently reviewed the preliminary search results. Of the initial pool of publications, relevant studies reporting morcellation-related reoperations were identified and read by all authors. Studies were included in this systematic review if patients underwent a second surgical procedure for 1 of the following indications: (1) onset of new clinical symptoms after a primary LM, LSCH, or TLH during which intracorporeal tissue morcellation was performed or (2) histopathology of the intracorporeally morcellated surgical specimen revealed malignancy. When patients presented with new clinical symptoms, it was imperative for the authors to attribute these symptoms and any subsequent intraoperative findings to the use of a morcellator during the primary surgical procedure.

### Exclusion Criteria

Studies in which hysterectomies and myomectomies were performed abdominally or vaginally were excluded

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