REVIEW

Radiofrequency Ablation of Uterine Fibroids

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ABSTRACT

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Uterine fibroids are a common occurrence in women. Treatment options range from medical management to surgeries, with hysterectomy providing the most effective treatment. Newer methodologies to treat fibroids continue to evolve, one being the use of radiofrequency ablation, which offers a minimally invasive and uterus-sparing technique to manage fibroids. This article provides a review of both laparoscopic and transvaginal approaches to radiofrequency ablation for the management of fibroids.

Keywords: radiofrequency, ablation, uterine, fibroids

INTRODUCTION

Uterine fibroids (also known as uterine leiomyomas) are a common gynecological condition affecting up to 80% of women during their reproductive years. Although often asymptomatic, fibroids can cause abnormal uterine bleeding, pelvic discomfort or bulk symptoms, urinary frequency, constipation, infertility, miscarriage, and other conditions prompting women to seek treatment. Treatment options include medical management with NSAIDS, combined hormonal contraceptives, progestins, antifibrinolytic agents such as tranexamic acid, GnRH analogues, or progesterone receptor modulators¹. Traditionally, medications have targeted abnormal uterine bleeding while invasive treatments wholistically target a combination of bleeding, bulk, and/or fertility symptoms associated with uterine fibroids. Invasive treatments range from interventional radiological procedures, such as uterine artery (or fibroid) embolization (UAE), or magnetic resonance guided focused radiofrequency ablation (MRgFUS), to surgical intervention. For many years, surgical options have been either myomectomy or hysterectomy achieved through both minimally invasive (laparoscopic, robotic, or minilaparotomy) and open techniques. However, novel interventions combining surgical laparoscopy with radiological guidance are growing in popularity. The purpose of this article is to review one of these newer combined techniques: radiofrequency thermal ablation.

In contrast to more invasive surgeries, such as abdominal myomectomies or hysterectomies, radiof-

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requency ablation (RFA) provides a safe, effective, and minimally invasive treatment for uterine fibroids. RFA uses alternating current in the radiofrequency range to produce coagulative necrosis. The use of radiofrequency ablation for tumors was first described in liver tumors, but is now applied to various sites including the lungs, kidneys, breasts, bone, and uterus². In 2012, the FDA approved the Acessa System as the first RFA treatment specifically for uterine fibroids. Multiple studies preceding and following FDA approval have demonstrated significant improvements in fibroid volume, menstrual blood loss, and patient satisfaction². In a systematic review of non-resective treatments for fibroids, RFA demonstrated higher pooled fibroid volume reduction at six months (70%) than both uterine artery embolization (54%) and focused ultrasound (32%)³. Another systematic review and meta analysis of prospective studies on the clinical performance of RFA for fibroid treatment found that fibroid volume decreased by 66% at 12 months' follow up. The annual cumulative reintervention rate was 4.2%, 8.2% and 11.5% over 3 years4.

Laparoscopic RFA

The Acessa RFA is a laparoscopic surgery coupled with pelvic ultrasound. Components include: a standard laparoscopic tower, a laparoscope, an RFA generator, a foot pedal, dispersive electrode pads, an RFA handpiece, and an ultrasound machine with a laparoscopic transducer. Two video monitors are required for proper visualization. Patients are positioned in the dorsal position with a tenaculum applied to the cervix for uterine manipulation. A 5-mm port is used for the laparoscope and a 10-12-mm port for the laparoscopic ultrasound transducer. The RFA electrode handpiece is introduced intra-abdominally through a 2-mm skin incision, and applied to the fibroid (Figure 1).

Appropriate placement of the handpiece to the fibroid is confirmed by ultrasound prior to activating ablation. The shaft of the RFA handpiece is insu-



Figure 1. Laparoscopic RFA.

lated to allow for deep penetration into the uterus while limiting damage to surrounding myometrium and serosa². Myomas larger than 4 cm often require overlapping ablations. RFA can achieve complete myoma resorption with small and medium-sized myomas². In one study, the cumulative rate of surgical repeat intervention for myoma-related symptoms was 11%, far less than the estimated 25% reported in previous literature⁵.

The American College of Obstetricians and Gynecologists recognizes laparoscopic radiofrequency ablation (Lap-RFA) as a clinically proven and safe option for fibroids, that should be offered to patients desiring symptomatic management of their fibroids⁶. Although hysterectomy remains the most definitive treatment for uterine fibroids, RFA is both effective and uterine-sparing. Lap-RFA is designed to spare non-fibroid tissue, and pregnancies have been documented in patients who have undergone Lap-RFA². Nonetheless, pregnancy data are limited, and ongoing research is being conducted to evaluate further the obstetrical outcomes for such patients.

Transcervical RFA

Radiofrequency ablation can also be achieved transcervically, thus avoiding both abdominal incisions and general anesthesia. The Sonata System, previously known as VizAblate, is a form of RFA that utilizes a transcervical approach to introduce radiofrequency ablation with intrauterine sonographic guidance. Unlike hysteroscopic methods, the Sonata System is not limited to submucosal fibroids, and unlike Lap-RFA, it does not penetrate the uterine serosa.

Components of the Sonata System include a reusable intrauterine ultrasound (IUUS) probe and a single-use disposable RFA handpiece that snap together into a single insertable device⁷. A small amount of hypotonic solution is inserted into the uterine cavity for acoustic coupling of the probe, which provides a 90-degree field of view and penetration over 9 cm (Figure 2).



Figure 2. Procedure of RFA.

The cervix is dilated, and the intrauterine ultrasound (IUUS) probe and RFA handpiece are inserted into the uterine cavity (Figure 3).



Figure 3. IUUS probe.

The Sonata Graphical Guidance Software, or SMART Guide[™], is used to customize the ablation application. The Fibroid Ablation Study-EU trial (FAST-EU), a multicenter prospective trial of 50 patients (92 fibroids), demonstrated a median reduction of 76.9% in perfused fibroid volume and a 62.5% decrease in total fibroid volume in 3 months; this increased to 73.3% and 73.3% at 12 months, respectively (citation needed). A significant number of patients (89.8%) reported a reduction in menstrual bleeding7. Preliminary results from the TransScervical Radiofrequency Ablation Uterine Fibroids Global Registry (SAGE registry), which characterizes 5-year outcomes of transcervical radiofrequency ablation (TFA) for fibroid management, demonstrated statistically significant decreases in symptom severity, and increases in quality of life. The reintervention rate for heavy menstrual bleeding was 5.6% at 2 years8. As with the Acessa system, successful pregnancy following treatment has been documented, however additional research is needed to delineate any impact of such procedures on fecundity.

Conclusion

Radiofrequency ablation, whether applied laparoscopically or transcervically, provides a minimally invasive and safe option for fibroid management. RFA allows the surgeon to target intramural and subserosal fibroids. In the case of transcervical RFA, the surgeon can avoid abdominal and serosal penetration entirely. Procedures tend to be short, outpatient and sustainable, with low re-intervention rates. For patients desiring a minimally invasive surgical option, radiofrequency ablation should be considered and offered to patients desiring treatment that is both highly effective and uterine-sparing.

Conflicts of interest

The authors have no conflict of interest.

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