



REVIEW ARTICLE

New strategies in the management of uterine fibroids: advances in ablation techniques

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ABSTRACT

Introduction: uterine fibroids represent the most prevalent benign pelvic neoplasm in women, associated with a significant burden of gynecological symptoms and impaired quality of life.

Objective: to critically evaluate the scientific evidence on the efficacy and safety of ablation techniques, particularly radiofrequency ablation, as a treatment for symptomatic uterine fibroids.

Methods: a systematic review of the scientific literature was conducted across multiple databases, using an algorithm with keywords and Boolean operators to identify relevant sources. Selected studies, after applying rigorous inclusion and exclusion criteria, were critically assessed for timeliness, methodological quality, and thematic relevance, and coherently integrated into the final synthesis of the review.

Development: the reviewed literature demonstrates that ablation, especially radiofrequency and MRI-guided focused ultrasound, induces an average volumetric reduction of 45–55 % in fibroids. Concurrently, clinically relevant improvement in major symptoms is observed, with reductions in menstrual bleeding (~70 %) and pelvic pain (~60 %). The safety profile is favorable, with mainly minor transient complications reported.

Conclusions: ablation is consolidated as a minimally invasive, effective, and safe alternative for the management of fibroids, offering advantages in uterine preservation and recovery times. Long-term studies are required to assess recurrence and optimize therapeutic protocols.

Keywords: Radiofrequency Ablation; Myoma; Uterine Neoplasms; Ablation Techniques; High-Intensity Focused Ultrasound Ablation.

INTRODUCTION

Uterine fibroids, also known as leiomyomas, are benign tumors that develop in the uterine smooth muscle and affect a large proportion of women of reproductive age. It is estimated that up to 75 % of women will develop fibroids during their lifetime, although not all will be symptomatic.⁽¹⁾

They can cause a variety of symptoms, including heavy menstrual bleeding, pelvic pain, and fertility issues, underscoring the importance of effective and appropriate management of this condition.^(2,3) Historically, treatment options included procedures such as hysterectomy—entailing complete uterine removal—and myomectomy, which involves surgical excision of fibroids.⁽¹⁾ Although these procedures can be effective, they are associated with significant risks, prolonged recovery periods, and potential complications such as infections and postoperative adhesions.⁽⁴⁾

Ablation as a treatment for fibroids represents a significant innovation in the field of gynecological medicine. This approach has been developed in response to the need for less invasive alternatives to traditional surgical options.⁽¹⁾ The demand for minimally invasive therapies has driven the development and implementation of ablation techniques. These methods use thermal energy, focused ultrasound, radiofrequency, or even laser to reduce or eliminate fibroids. The importance of these advances lies in improving patients' quality of life by reducing complications, shortening recovery times, and preserving fertility when possible. Furthermore, these techniques minimize surgical trauma and offer a treatment option for women who cannot undergo major surgery due to preexisting medical conditions.⁽⁵⁾

The current state of fibroid treatment with ablation shows promising results but also presents challenges. Recent research has demonstrated significant reductions in fibroid size and associated symptoms, such as excessive bleeding and pelvic pain.⁽⁶⁾ Studies reveal that magnetic resonance-guided focused ultrasound significantly reduced fibroid volume and improved symptoms in long-term follow-up.⁽⁷⁾ However, concerns remain regarding variability in efficacy and the lack of long-term data on treatment outcomes. Some studies have indicated that fibroid recurrence may be an issue, and that effectiveness may depend on factors such as the size and location of the treated fibroids.^(8,9,10)

These considerations motivated the development of the present review, which aimed to critically evaluate the scientific evidence on the efficacy and safety of ablation techniques—particularly radiofrequency ablation (RFA)—for the treatment of symptomatic uterine fibroids.

METHODS

This study was designed as a systematic bibliographic review to synthesize the available evidence on ablation techniques for uterine fibroids. The methodology was structured in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency and reproducibility in the identification, selection, and analysis of the scientific literature.

The literature search was limited to the ten years preceding the preparation of this review to gather up-to-date evidence. The electronic databases PubMed, Scopus, and Cochrane Library—recognized as leading sources in health sciences—were consulted. Additionally, reference lists from selected articles and previous systematic reviews were examined to identify potentially relevant studies (secondary search). The search strategy combined key terms and their MeSH/DeCS-controlled synonyms—such as "uterine fibroid," "leiomyoma," "ablation," "radiofrequency ablation," and "focused ultrasound"—linked by Boolean operators (AND, OR). No language restrictions were applied in the initial search, although publications in Spanish, English, and Portuguese were prioritized.

Clearly defined inclusion and exclusion criteria were established. Included were original articles (randomized controlled trials, cohort studies), systematic reviews, and meta-analyses published within the defined timeframe that specifically addressed the use of thermal ablation techniques for symptomatic uterine fibroids and reported data on efficacy (volume reduction, symptom improvement) or safety. Excluded were duplicates, case reports, editorials, letters to the editor, articles without full-text access, preliminary studies (abstracts), and those whose population or intervention did not directly align with the objectives of this review.

The selection process was carried out in several phases. First, titles and abstracts were screened to exclude non-relevant records. Subsequently, full texts of potentially eligible articles were reviewed. Initially, 109 records were identified; 76 were excluded prior to screening due to duplication or lack of relevance. After title and abstract screening, 33 articles were selected, of which 28 underwent full-text review. Finally, 16 studies were included in the qualitative analysis.

Data extraction and analysis were performed systematically, collecting key variables such as author, publication year, methodological design, study population or sample, main findings, and conclusions. Comparative tables were developed to organize the information and facilitate result interpretation. The analysis focused on qualitative synthesis, as methodological and outcome heterogeneity precluded quantitative meta-analysis.

DEVELOPMENT

The reviewed scientific evidence was organized according to methodological design, main thematic focus, and corresponding level of evidence, following the standard hierarchical evidence pyramid. Table 1 presents the main findings.

Table 1. Key findings.

Source	Methodology	Procedure	Main Results
Stewart EA et al.,(2003) ⁽¹⁾	Prospective safety and feasibility study	HIFU procedure analyzed	Safe and feasible technique for non-invasive thermal ablation of uterine fibroids.
Abarca Ventura J,(2024) ⁽²⁾	Descriptive observational study	Epidemiological and clinical characteristics of uterine fibroids at Ica Regional Hospital analyzed	Description of uterine fibroid population in a regional hospital
Lumsden MA et al.,(2015) ⁽³⁾	Narrative review and clinical guideline development	Diagnosis and management of fibroids analyzed	Evidence synthesis for clinical practice
Donnez J et al.,(2020) ⁽⁴⁾	Narrative review on uterine fibroid management and update in human reproduction	Current and future fibroid management analyzed	Comprehensive perspective on treatment, including emerging techniques
Jacoby VL et al.,(2016) ⁽⁵⁾	Randomized clinical trial	MRI-guided HIFU procedure analyzed	Demonstrated safety and good one-year outcomes in symptom reduction
Palomo MLC,(2023) ⁽⁶⁾	Narrative review on non-surgical techniques for uterine fibroid treatment	Non-surgical techniques analyzed: uterine artery embolization, HIFU, and RFA	Comparison of non-surgical techniques, highlighting indications and outcomes
Padrón Espinoza MV,(2022) ⁽⁷⁾	Narrative review on medical, radiological, and surgical management of uterine fibroids in women of reproductive age	Medical, radiological, and surgical management analyzed	Multidisciplinary approach in reproductive-age women
Gracia M et al.,(2023) ⁽⁸⁾	Narrative review on uterine fibroids	Controversies in fibroid treatment analyzed	Critical analysis of therapeutic options and clinical decisions
Guarnizo-Gómez DM et al.,(2017) ⁽⁹⁾	Systematic review on controversies in fibroid treatment	General characteristics of uterine fibroids analyzed	Updated evidence synthesis on etiology, diagnosis, and treatment
Timana Gutiérrez G,(2025) ⁽¹⁰⁾	Analytical observational study on risk factors associated with uterine fibroids in patients at the Gynecology and Obstetrics Service of Arzobispo Loayza National Hospital, Lima, Peru	Risk factors for uterine fibroids analyzed	Identification of associated factors in a hospital population

Notes: HIFU (High-Intensity Focused Ultrasound); RFA (Radiofrequency Ablation)

Uterine fibroids represent a significant burden on women's health, with a prevalence reaching up to 75 % in the general population. Given that approximately 60 % of cases are symptomatic—causing menorrhagia, pelvic pain, and fertility impairment—the development of effective and conservative therapeutic options is a clinical priority. Traditionally, hysterectomy and myomectomy have been the cornerstones of management, but their invasive nature, prolonged recovery time, and associated risks have driven the search for alternatives. In this context, minimally invasive ablation techniques have emerged as a promising innovation for the treatment of symptomatic fibroids.^(1,4)

Among the various ablative techniques, RFA and MRI-guided HIFU (MRgFUS) have demonstrated notable efficacy. Consolidated scientific evidence indicates that these procedures induce an average fibroid volumetric reduction ranging from 45 % to 55 %.^(5,11,12) This anatomical reduction directly translates into significant clinical improvement. Systematic studies report an average reduction in menstrual bleeding (assessed using scales such as PBAC) of approximately 70 % and a reduction in pelvic pain of about 60 %.⁽¹³⁾ The precision of techniques like MRgFUS—which allows thermal targeting of fibroid tissue while preserving healthy myometrium—is fundamental to these outcomes.⁽¹⁴⁾

The safety profile of these interventions constitutes one of their main comparative advantages. The literature consistently reports a low incidence of serious complications, with minor and transient adverse events—such as post-procedural pain or mild discomfort—predominating and typically resolving with conservative management. This favorable risk-benefit profile positions these techniques as especially valuable options for women who wish to preserve their reproductive potential or who have comorbidities that contraindicate major surgery. Compared to hysterectomy, they offer significantly shorter recovery times and lower overall morbidity.⁽³⁾

Nevertheless, a critical analysis of the evidence reveals areas of uncertainty requiring further research. Efficacy may vary according to individual fibroid characteristics—such as size, location, and vascularity—highlighting the importance of meticulous patient selection.⁽¹⁵⁾ Likewise, the possibility of long-term symptom recurrence remains a concern, underscoring the need for extended follow-up studies to assess the sustainability of benefits.⁽¹⁶⁾ Future research should focus on optimizing ablation protocols, clearly defining eligibility criteria, and exploring potential synergies with other therapies to maximize clinical outcomes and patients' quality of life.

CONCLUSIONS

Ablation is consolidating as a less invasive alternative to traditional surgery, offering advantages in recovery, safety, fibroid volume reduction, and symptom improvement. The validation of advanced techniques combining focused ultrasound with magnetic resonance imaging confirms their precision and efficacy over shorter timeframes, while also emphasizing the importance of comprehensively evaluating patients' quality of life. Looking ahead, it is recommended to investigate the durability of benefits, fibroid recurrence rates, optimization of protocols, and the potential combination with other therapies to enhance clinical outcomes.

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