

Uterine Artery Embolization for the Treatment of Adenomyosis: A Review

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ABSTRACT

During the past 10 years, uterine artery embolization (UAE) has been investigated as a possible therapy for adenomyosis. All publications available from 1999 through 2010 are included in this report. Levels of evidence and trial classifications were evaluated according to the guidelines developed by the United States Preventive Services Task Force. Long-term data are available from 511 affected women from 15 studies. Improvements were reported by 387 patients (75.7%). The median follow-up was 26.9 months. UAE as treatment for adenomyosis shows significant clinical and symptomatic improvements on a short- and long-term basis.

ABBREVIATIONS

JZ = junctional zone, UAE = uterine artery embolization, USPSTF = United States Preventive Services Task Force

Adenomyosis is often described as the presence of endometrial islets or ectopic growth within the myometrium, consisting of epithelial and stromal elements. Usually these elements are found at least 2.5 mm below the endometrial–myometrial junction. The disease affects predominantly the posterior uterine wall and manifests itself in diffuse or focal form (1–5). Diffuse enlargement of the uterus and widening of the junctional zone (JZ) further characterize this benign, yet discomfiting, disease (6). The uterus can appear firm and globular, and hemorrhagic foci and a trabeculated myometrium can be observed (7).

In the literature, the prevalence of adenomyosis in tissues obtained from hysterectomy is reported to be between 8.8% and 31% (8,9). If broad criteria for the diagnosis of adenomyosis are used, some data suggest a prevalence as high as 70% in women between 40 and 50 years of age (10).

The diagnostic modalities of magnetic resonance (MR) imaging and transvaginal sonography have been well described in the literature (1–3,11,12). MR imaging offers reported sensitivity rates of 78%–88% and specificity rates of 67%–93% (1,13,14). In the literature, the findings of

accuracy comparisons between transvaginal sonography and MR imaging are split, with some studies reporting equality (13,14), whereas others describe MR imaging as significantly better (1). Additionally, on MR imaging, endometrial size, myometrial vascularization, edema, and stromal proliferation may have an effect on signal intensity of adenomyosis (15,16).

The usual symptoms of adenomyosis, including dysmenorrhea, metrorrhagia, and menorrhagia, mimic nonspecific indicators of other pelvic and uterine disorders such as leiomyomas, endometriosis, or uterine malignancies (7). This makes preoperative diagnosis difficult, with reported rates ranging between 2.6% and 26% (17).

UTERINE ARTERY EMBOLIZATION

In 1995, Ravina et al (18) published the first report of women treated by uterine artery embolization (UAE) for symptomatic uterine leiomyomas (18). A minimally invasive therapeutic alternative to surgery, UAE, has been reported to be effective and associated with high patient satisfaction rates (18–26). In addition, this procedure provides better cost effectiveness and a shorter recovery period than surgical techniques (19,27–30). The major objective of any therapy for nonmalignant disease is to improve the patient's health-related quality of life (30). Possible side effects and drawbacks associated with UAE include post-embolization syndrome, pain, nausea, and hematoma at the femoral puncture site (27,29). Although there exists a low stochastic radiation risk, exposure amounts of approximately 20 cGy of radiation are reported (27,29,31).

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Table 1. Classification of Trial Design and Quality of Evidence per USPSTF Criteria

Category	Description
Classification of trial design:	
internal validity	
I	Properly powered and conducted RCT; well conducted systematic review or metaanalysis of homogeneous RCTs
II-1	Well designed controlled trial without randomization
II-2	Well designed cohort or case-control analytic study
II-3	Multiple time series with or without the intervention; dramatic results from uncontrolled experiments
III	Opinions of respected authorities, based on clinical experience; descriptive studies or case reports; reports of expert committees
Quality of evidence	
Good	Evidence includes consistent results from well designed, well conducted studies in representative populations that directly assess effects on health outcomes
Fair	Evidence is sufficient to determine effects on health outcomes, but the strength of the evidence is limited by the number, quality, or consistency of the individual studies, generalizability to routine practice, or indirect nature of the evidence on health outcomes
Poor	Evidence is insufficient to assess the effects on health outcomes because of limited number or power of studies, important flaws in their design or conduct, gaps in the chain of evidence, or lack of information on important health outcomes

Note.—RCT = randomized controlled trial; USPSTF = United States Preventive Services Task Force.

UAE for Adenomyosis and Uterine Leiomyomas

Based on the positive results reported regarding UAE as treatment for uterine leiomyomas (20,22,24,28,32–38), this interventional procedure has been investigated as a possible therapeutic tool to treat adenomyosis. Additionally, the constellation of symptoms of uterine leiomyomas and adenomyosis are similar. This similarity paved the way for UAE to be used as a therapeutic measure not only for patients with leiomyomata but also adenomyosis. During the past 10 years, several studies have documented attempts to treat adenomyosis with UAE (20,32,36,39–50).

Histologic transformations, hyaline degeneration, and necrosis of leiomyomata have been described after UAE (32,51). Similar postembolization effects may occur for adenomyosis. Similar to leiomyomas, instillation of the embolization material may invoke thrombosis and platelet aggregation in adenomyotic foci through immunogenic foreign body response. A prerequisite for this to occur is the cessation of arterial blood flow to the extent, at minimum, of near-stasis (47,52).

This review represents a compendium of studies detailing UAE as a treatment choice for adenomyosis and was performed to determine the quality of the literature and to summarize the clinical and imaging outcomes.

METHODOLOGY

All publications retrievable through MEDLINE, EMBASE, or PubMed with keywords such as “adenomyosis,” “UAE,”

“uterine fibroid embolization,” “adenomyosis therapy,” “adenomyosis treatment,” and “embolization for adenomyosis” were included in this report. No institutional review board approval is necessary at our institution for systematic reviews or similar publications such as this. All studies, prospective and retrospective in nature, written or abstracted in English were included. Excluded from analysis were all publications in which none of the patients had some form of adenomyosis. Data available from reports from 1999 through 2010 were analyzed. Based on the definitions of the United States Preventive Services Task Force (USPSTF), the quality level of evidence and the classification of trial design were classified as good, fair, and poor and as level I, II, or III, with three subcategories in level II, respectively (Table 1) (53,54). A χ^2 test was used to determine significance for grouped results (Fig 1).

RESULTS

In summarizing the available publications, long-term follow-up data after UAE were available in 511 affected women. The 15 studies included report on outcomes from two to 159 patients per study at the longest reported follow-up. Improvements in symptoms largely related to bleeding, pain, and bulk-related discomfort were reported by 387 patients (75.7%). The median follow-up for the collective group is 26.9 months (Table 2) (20,32,39–47,49,50,55,56). A graphical representation of the studies, their success

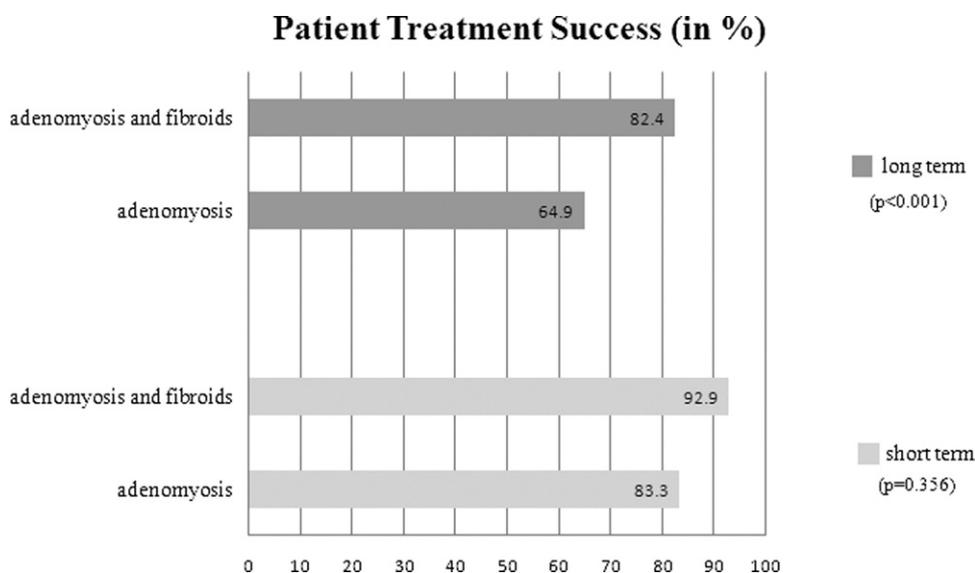


Figure 1. Percentages of patients reporting significant improvement in symptoms.

rates, and their upper and lower confidence limits are shown in **Figure 2**.

The studies included are mostly level II-2 to level III studies per USPSTF criteria. Some better designed trials offer a level II-1 classification (53,54). We found no published randomized, blinded, controlled trials assessing the efficacy of UAE as a treatment for adenomyosis. The overall quality of evidence, as defined by USPSTF, is to be considered fair (**Table 2**).

The studies detailed herein are separated into those in pure adenomyosis and adenomyosis with uterine leiomyomas. In addition, the studies are divided into short-term (≤ 12 mo) and midterm/long-term (> 12 mo) studies. This allows for grouping of results and comparison of short-term and midterm/long-term trends according to pathologic findings (**Fig 1**).

Short-Term Results

Pure adenomyosis. In total, 102 patients were treated in this subgroup, with an improvement rate of 83.3% after a median follow-up of 9.4 months (**Table 3**) (20,32,40,42,44,45,49,50). In 1999, the first report of UAE as treatment for adenomyosis—in three patients—was published. These patients responded well to the intervention, with marked or complete improvement of clinical symptoms (20). Similarly, 12 of 13 women in a subsequent study (32) reported overall quality of life improvement, average JZ thickness reduction by 33%, and uterine volume decrease by 42%.

A similarly encouraging observation was made by Chen et al (40), in which 19 of 23 Chinese patients treated with UAE for adenomyosis had a significant decrease in uterine size. After initial and complete absence of symptoms after embolization, only two cases of dysmenorrhea recurred.

A study published in 2003 (49) showed a decrease in

adenomyosis-related symptoms in three of 12 treated patients. This study represents an outlier with regard to trends seen in other publications. Because this study (49) is only abstracted in English and the remainder of the publication was published in Chinese, no further information is available to investigate possible causes of these results.

In two trials that used pre- and postinterventional MR imaging to confirm adenomyosis without uterine leiomyomas (44,45), multiple parameters had improved significantly at follow-up. Urinary symptoms, pelvic heaviness, dysmenorrhea, and menorrhagia decreased significantly after embolization. Overall, more than 70% of patients showed devascularization, and uterine volumes decreased by 25%–32% (44,45). Similarly, three patients with pure adenomyosis showed improvement subjectively and clinically after intervention. MR imaging confirmed areas of devascularization and, in eight patients, a reduction in JZ thickness of 19.8%–61.4% was observed (42).

Adenomyosis and uterine leiomyomas. In the subset of patients with adenomyosis and uterine leiomyomas, 92.9% reported significant improvements after a median follow-up of 10.7 months after UAE. Thirteen of 14 patients from three studies (32,42,45) showed improvements in overall quality of life and reductions in JZ thickness and uterine size after MR imaging follow-up (**Table 4**) (32,42,45).

Midterm/Long-Term Studies

Pure adenomyosis. After a median follow-up of 40.6 months in the subgroup of patients with only adenomyosis, 135 of 208 patients (64.9%) reported sustained improvements after UAE (**Table 5**) (39,41,43,46,47,56). A prospective study of 18 women with adenomyosis provided only some comparative information on short-term and long-term results (47). Diagnosis was made based on MR imaging

Table 2. Summary of Relevant Published Studies (20,32,39–47,49,50,55,56)

Study, Year	Pts.*	Symptoms		Follow-up (mo)
		Improved	Type of Symptoms Evaluated	
Goodwin et al (20), 1999	3	3 (100)	Bleeding, pain, uterine volumes	10.2
Siskin et al (32), 2001	13	12 (92)	Bleeding, pain, BRS, uterine and tumor volumes	8.2
Wood et al (50), 2001	2	2 (100)	Menorrhagia, dysmenorrhea, BRS, uterine volumes, JZ	NA
Chen et al (40), 2002	23	19 (83)	Menorrhagia, dysmenorrhea, BRS, uterine volumes	NA
Jha et al (42), 2003	9	9 (100)	Menorrhagia, dysmenorrhea, BRS, uterine volumes, JZ	12.0
Toh et al (49), 2003	12	3 (25)	General symptoms, MR features	10.9
Kim et al (44), 2004	43	40 (93)	Menorrhagia, dysmenorrhea, BRS	3.5
Pelage et al (47), 2005	9	5 (55)	Menorrhagia, BRS, uterine volumes	24.0
Chen et al (55), 2006	159	131 (82)	Menorrhagia, dysmenorrhea	50.0
Kitamura et al (45), 2006	11	10 (91)	Bleeding, pain, BRS, Uterine volumes	12.0
Kim et al (43), 2007	54	31 (57)	Menorrhagia, dysmenorrhea, BRS	58.8
Lohle et al (46), 2007	38	32 (84)	Bleeding, pain, BRS, uterine and tumor volumes	16.5
Bratby et al (39), 2008	11	7 (64)	Menorrhagia, dysmenorrhea, BRS	36.0
Duan et al (41), 2008	23	19 (83)	Menorrhagia, dysmenorrhea, uterine volume, hormone levels	60.0
Chen et al (56), 2008	101	64 (63)	Dysmenorrhea	48.0
Total/median	511	387 (75.7)	–	26.9

Note.—Values in parentheses are percentages. BRS = bulk-related symptoms; GFP = gelatin sponge/foam particles; JZ = junctional zone; KMG = sodium alginate microspheres; NA = not applicable; nsPVA = nonspherical polyvinyl alcohol; PVA = polyvinyl alcohol; TGM = tris-acryl gelatin microspheres; USPSTF = United States Preventive Services Task Force.

* Number of patients at latest follow-up.

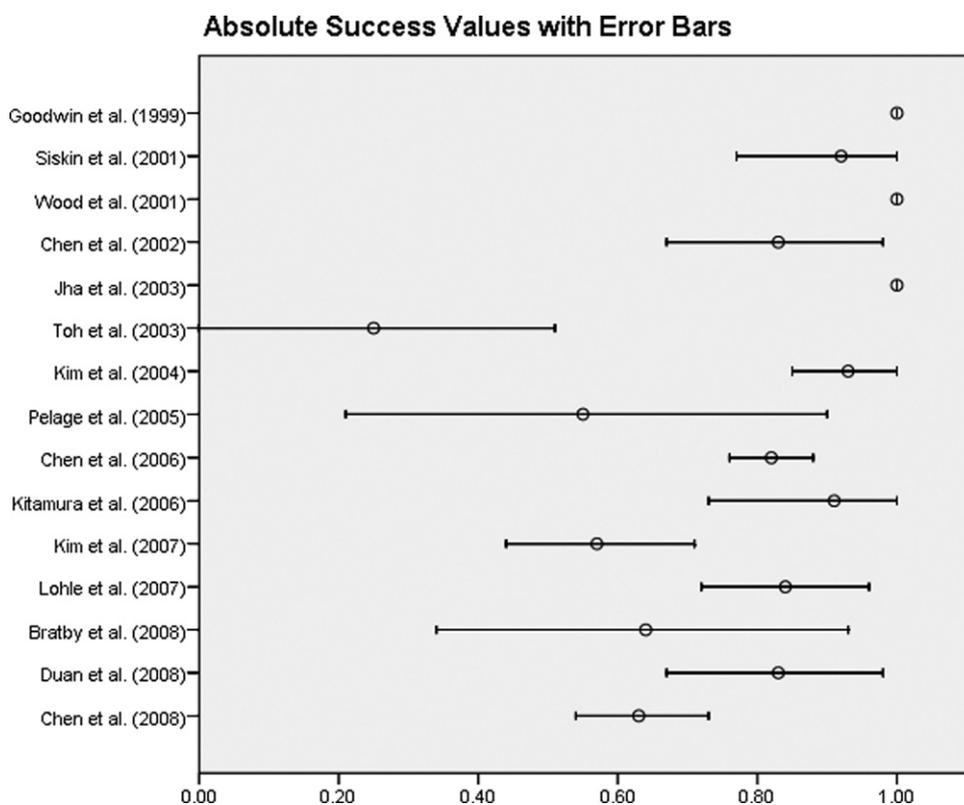


Figure 2. Absolute values of improvement with lower and upper limits of confidence for each study. Values of 0–1 represent percentages of 0%–100%.

proof of JZ widening or heterogeneous uterine appearance by means of sonography. Follow-up at 2 years provided information on nine women. Five reported a total resolution

of bleeding symptoms. Of the initial 18 patients, five (28%) required hysterectomies and three other patients needed additional therapy (47). Although the patient cohort is too

Embolization Material	Type of Study	USPSTF	
		Trial Design	Evidence Quality
NA	Retrospective	II-3	Poor
355–500 μm PVA	Retrospective	II-3	Fair
NA	Retrospective	III	Poor
GFP	Retrospective	II-3	Fair
500–700 μm PVA	NA	II-2	Fair
PVA	Retrospective	II-3	Poor
250–700 μm PVA	Retrospective	II-2	Good/Fair
355–500 μm PVA, 500–900 μm TGM, 4 \times nsPVA; 3 \times GFP	Prospective	II-1	Good/Fair
GFP, PVA, KMG	Retrospective	II-3	Fair
355–500 μm PVA, 500–700 μm TGM	Prospective	II-1	Fair
250–710 μm PVA, secondary agent GFP	Retrospective	II-2	Fair
32 \times 500–700 μm TGM, 6 \times 700–900 μm TGM	Prospective	II-1	Good/Fair
355–500 μm PVA	Prospective, observational	II-3	Fair
500–700 μm KMG	Retrospective	II-3	Fair
KMG	NA	II-3	Fair
–	–	–	Fair

Table 3. Results of Published Studies of Adenomyosis with Short-term Follow-up (20,32,40,42,44,45,49,50)

Study, Year	Pts.	Improved	Follow-up (mo)
Wood et al (50), 2001	2	2	NA
Goodwin et al (20), 1999	3	3	10.2
Siskin et al (32), 2001	6	6	8.2
Chen et al (40), 2002	23	19	NA
Jha et al (42), 2003	3	3	12.0
Toh et al (49), 2003	12	3	10.9
Kim et al (44), 2004	43	40	3.0
Kitamura et al (45), 2006	10	9	12.0
Total	102	85 (83.3%)	9.4

Note.—NA = not applicable.

small to allow for definitive conclusions, a difference in short-term and long-term results can be observed. The 55% success rate 2 years after intervention is seen, in a sense, as a disappointing result (47), but UAE could also be viewed as a successful, viable treatment option for women interested in retaining their fertility (57). Similar results were obtained in a retrospective assessment of prospectively gathered data of 54 women treated for pure adenomyosis (43): 31 (57.4%) reported treatment success over the long term (mean follow-up, 58.8 mo). Nineteen patients experienced symptom recurrence after a mean of 17.3 months after UAE. Changes in subjective scores for menorrhagia and dysmenorrhea before and after UAE indicated significant improvement in the long term. The mean reduction of

Table 4. Results of Published Studies of Adenomyosis and Uterine Leiomyomas with Short-term Follow-up (32,42,45)

Study, Year	Pts.	Improved	Follow-up (mo)
Siskin et al (32), 2001	7	6	8.2
Jha et al (42), 2003	6	6	12.0
Kitamura et al (45), 2006	1	1	12.0
Total	14	13 (92.9%)	10.7

uterine volume 58.8 months after embolization was 27.4%. As a result of recurrence of symptoms, five patients underwent hysterectomy. Of five women who become pregnant, three carried to term a healthy neonate. Two women decided on abortion because the pregnancy was unplanned or unwanted (43).

In a study by Lohle et al (46), 38 women in whom pharmacologic treatment or myomectomy for adenomyosis had failed were treated with UAE. Three subgroups were established: adenomyosis only, dominant adenomyosis with leiomyomas, and adenomyosis with leiomyomata dominance. In all three groups, bleeding symptoms, pain, and bulk-related problems improved after embolization after a median follow-up of 16.5 months. MR imaging at 1 year after UAE demonstrated reductions of tumor volume, uterine volume, and JZ thickness of 77.1%, 44.8%, and 23.9%, respectively. Improvements were reported to have occurred in similar fashion across all three groups. Six patients underwent further surgery, including five hysterectomies and one adenoma resection. Aside from these six patients,

Table 5. Results of Published Studies of Adenomyosis with Long-term Follow-up (39,41,43,46,47,56)

Study, Year	Pts.	Improved	Follow-up (mo)
Pelage et al (47), 2005	9	5	24.0
Kim et al (43), 2007	54	31	58.8
Lohle et al (46), 2007	15	12	16.5
Bratby et al (39), 2008	6	4	36.0
Duan et al (41), 2008	23	19	60.0
Chen et al (56), 2008	101	64	48.0
Total	208	135 (64.9%)	40.6

satisfaction with UAE was reported by all participants. Of patients with adenomyosis only (n = 15), 83% reported that they were very satisfied with the procedure (46).

Bilateral UAE was performed in 26 women with symptomatic, MR imaging–confirmed adenomyosis in a prospective, observational study by Bratby et al (39). Using a standardized questionnaire, clinical evaluations were performed at regular intervals. Sixteen patients were evaluated at follow-up after 12 months. Symptoms of menorrhagia resolved or improved in 13 patients (79%), as did dysmenorrhea symptoms in 16 (93%) and bulk-related problems in 12 (75%). The clinical follow-up at 2 years demonstrated a slight decline on average in the number of patients with continued improvement. Dysmenorrhea remained controlled in 93% of patients (n = 16), as did bulk-related symptoms in 75% (n = 12). Menorrhagia control was noted in only 55% of patients (n = 6). There was a continued decrease in the proportion of patients with controlled menorrhagia at 3 years (45.5%) (39).

Two studies from China abstracted in English (41,56) reported successful outcomes after 48 and 60 months of follow-up, respectively. Chen et al (56) evaluated timing of UAE during the menstrual cycle in terms of differences in treatment efficacy. Patients were scheduled for UAE during the proliferative or luteal phase of menstruation. Follow-up was provided after 1, 2, 3, and 4 years after embolization, with 142, 128, 119, and 101 patients available for clinical examination at those intervals, respectively. Their data showed that the difference in timing of UAE did not have a significant effect on efficacy in the treatment of adenomyosis. Relief of dysmenorrheal symptoms showed similar results in both groups. The authors concluded that, although UAE is effective for the treatment of adenomyosis, the timing of UAE has no significant relevance in its effect on dysmenorrhea (56). In a similar setup, changes in hormone levels were tracked in addition to dysmenorrhea, menorrhagia, and uterine volume parameters in another study (41). Among the variables determined before and after UAE, follicle-stimulating hormone, luteinizing hormone, estradiol, and serum cancer antigen 125 levels were recorded. Follicle-stimulating hormone, luteinizing hormone, and estradiol levels did not change at any time point after UAE.

Table 6. Results of Published Studies of Adenomyosis and Uterine Leiomyomas with Long-term Follow-up (39,46,55)

Study, Year	Pts.	Improved	Follow-up (mo)
Lohle et al (46), 2007	23	19	16.5
Chen et al (55), 2006	159	131	50.0
Bratby et al (39), 2008	6	4	36.0
Total	188	154 (81.9%)	34.2

Significant reductions were reported in dysmenorrhea, menorrhagia, uterine volume, and serum cancer antigen 125 levels at various follow-up periods. These authors also concluded that UAE seemed to be effective in the long-term treatment of diffuse adenomyosis (41).

Adenomyosis and uterine leiomyomas. In the subgroup of patients with adenomyosis and uterine leiomyomas, long-term follow-up (34.2 months) showed that 82.4% of patients (154 of 187) reported significant improvement after UAE (Table 6) (39,46,57). In a large study abstracted in English (57), clinical effectiveness was observed in 82.4% of patients (131 of 159), with 5% of patients not showing a response to embolization at all (57).

One study (46) evaluated 23 women clinically and by means of MR imaging before and after UAE for symptomatic adenomyosis with leiomyomas. In the adenomyosis/leiomyoma group and the leiomyomata-dominant group, 75% and 50% reported that they were very satisfied with the interventional results, respectively (46).

Complications

Not all studies reported on complications or the need for further treatment. In total, there were 37 hysterectomies reported among 280 patients (13.2%), with a majority occurring approximately 12 months after intervention (range, 2–27 mo) (39,42,43,46,47,57). Thirteen of 62 women (20.9%) experienced permanent amenorrhea 3–6 months after UAE (32,39,46). All 13 patients were older than 45 years of age. Most patients experienced some form of mild postembolization syndrome. There were no deaths or serious adverse events related to UAE reported.

Imaging Findings

MR imaging demonstrated significant modifications after UAE. Uterine volumes and JZ thickness showed reductions of 27.4%–54.0% and 12.0%–23.9%, respectively (32,39,42,43,45–47). Although one study (42) reported no correlation between image findings and clinical symptom reduction, other reports (32,43–45,47) stated that areas of devascularization, necrosis, or infarction did indeed correspond to subjective improvement. These improvements seem to be particularly prominent in the short term and tend to diminish over time. This was observed in one study (43) in which temporary areas of necrosis had been replaced by segments

of vital tissue after long-term follow-up imaging was performed.

DISCUSSION

Definitive treatment for diffuse adenomyosis usually requires hysterectomy in the presence of inadequate response to endometrial ablation or hormonal therapy (58). The disappearance of symptoms after the surgical removal of the uterus renders patients highly satisfied with the approach (59) when fertility is not an issue. Forty-three percent of women who underwent hysterectomy expressed disappointment about their loss of fertility (59). In scientific literature, rates of complication after hysterectomy range between 1.5% and 29.3% (60). Hysterectomy, a major surgical procedure, is associated with complications such as blood loss, bowel and general urogenital injury, pain, and infection (59,60). Recovery time is reported to range between 6 and 8 weeks (61), and health care–related expenses and lost time at work (62) render hysterectomy an option associated with high costs.

The present review reports on the outcomes of 15 studies performed during the past 10 years. The evolution of the UAE technique has progressed, and its standardization has solidified (63,64).

In this analysis, short-term outcomes regarding symptom relief after UAE for pure adenomyosis and adenomyosis with uterine leiomyomas range from 83.3% to 92.9%, respectively. In the long term, patients report significant symptomatic improvement of 64.9% (in pure adenomyosis) and 82.4% (in adenomyosis with leiomyomas). In contrast, hysterectomy offers full symptom relief.

Aside from technique, the methodologic designs of the studies included are not equivalent. This makes the comparison of results rather complex. First, none of the reports offer level I evidence regarding data quality, as there are no randomized controlled trials available in the literature. The overall quality of evidence of the presented studies, evaluated according to USPSTF grade definitions, is fair (53,54). The internal validity or trial classification, as expressed by each study's particular research design level, ranges from level II to level III (53,54). The classifications were performed to assess the general impression the detailed studies offer with respect to quality and generalizability. The qualitative assessment is limited, as it is subjective and the available guidelines are not rigid. In addition, the diagnosis of adenomyosis is not carried out uniformly across the described studies. Methodologies in general are varied across the studies. Outcomes after embolization are difficult to assess for all patients presented in this report, as these measures also lack standardization with respect to each other. Additionally, in clinical practice, adenomyosis is frequently associated with uterine leiomyomas. In this setting, we do not always know if symptomatic improvement is related to leiomyoma and/or adenomyosis modifications after UAE. Also, differing embolic materials were used (Table 2). The most widely used embolic agent was non-

spherical polyvinyl alcohol particles, which ranged in size from 255 μm to 900 μm . From the available data, there is insufficient evidence to provide a recommendation on the best embolization agent.

Ideally, although potentially difficult to realize, a high-quality study would have all patients included in a randomized, controlled trial measuring the efficacy of UAE for adenomyosis, and the resultant data would be evaluated through standardized elements across the board. These elements include methodology, diagnostic criteria, outcome measures, follow-up intervals, diagnostic workup at follow-up, and objectivity regarding symptom relief.

The most difficult aspect to realize is objective symptom assessment, as each patient individually provides symptom data, rendering this information subjective in nature. Data from the reviewed studies showed that symptomatic improvement is most dramatic in the short term (3–12), with trends toward recurrence of symptoms during the long term (39,45).

Conclusions

Among the 511 women described in the present review, symptomatic relief was reported by 387 (75.7%), a significant majority. Although the level of evidence of available studies is only fair per USPSTF criteria, sustained clinical and symptomatic improvements were reported. Minimal side effects, cost-effectiveness benefits, and retention of fertility render UAE an attractive treatment option. The results presented in this review are promising, but are insufficient to establish embolization as a potential first-line treatment for adenomyosis. Larger-scale, randomized trials producing high-quality data will be necessary to determine the true value of this treatment. These outcomes then need to be verified over the long term with respect to sustained symptomatic relief to validate UAE as an effective option for women with adenomyosis who wish to retain their fertility and/or opt for a minimally invasive treatment approach.

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CME TEST QUESTIONS

Examinations are available at <http://Learn.SIRweb.org>.

The CME questions in this issue are derived from the article “Uterine Artery Embolization for the Treatment of Adenomyosis: A Review” by Popovic et al.

1. When looking at uterine artery embolization (UAE) for the treatment of adenomyosis:
 - a) The authors believe that the evidence is strong enough to establish UAE as first-line treatment.
 - b) UAE was very successful in the short term and remained surprisingly durable for the long term.
 - c) Overall, improvement in symptoms relating to bleeding, pain, and bulk occurred in about three of four women in the reviewed studies.
 - d) In studies that included the pertinent data, when hysterectomy occurred it was generally performed more than 2 years after the embolization procedure.
2. In the studies that included short-term results following UAE for adenomyosis:
 - a) Isolated adenomyosis had symptomatic improvement in 73% of patients.
 - b) MR imaging follow-up suggests uterine volume reduction by 40%–45% for isolated adenomyosis.
 - c) When associated with uterine fibroids, symptomatic improvement occurred even more often.
 - d) Despite studies showing uterine size reduction, the junctional zone remained unchanged.
3. When data was available for mid- and long-term follow-up:
 - a) Symptomatic improvement decreased to less than one-half when isolated adenomyosis was considered.
 - b) Most of the data pertaining to adenomyosis associated with uterine fibroids came from one study.
 - c) Coexistence of uterine fibroids no longer affected the symptom improvement rate.
 - d) Women who subsequently became pregnant were unable to carry a term pregnancy.
4. Regarding the evidence supporting UAE for adenomyosis:
 - a) Overall, the quality of the evidence was considered good.
 - b) Only two randomized, blinded, controlled clinical trials could be identified.
 - c) When taking into account associated complications and recovery time, UAE was felt to be related to higher cost than hysterectomy.
 - d) Limitations of the analysis include lack of a uniform method of diagnosis of adenomyosis and use of varying embolics.