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Systematic review and meta-analysis of current evidence in uterine artery embolization vs myomectomy for symptomatic uterine fibroids

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This review compares the efficacy of Uterine Artery Embolization (UAE) and Myomectomy (MYO) in managing symptomatic Uterine Fibroids (UFs) in women who do not want hysterectomy. A meta-analysis was performed on all available studies that evaluated the relative benefits and harms of MYO and UEA for the management of patients suffering from UFs. Outcomes evaluated reintervention, UFs scores for quality of life (QOL) and symptom severity, and other complications. To determine mean differences (MDs) or odds ratios (ORs) with 95% confidence intervals (CIs), a random or fixed-effects model was utilized. A meta-analysis of 13 studies (9 observational and 4 randomized controlled trials) was conducted. The results indicated that UAE had a higher reintervention rate (OR 1.84; 95% CI 1.62–2.10; $P < 0.01$; $I^2 = 39\%$), hysterectomy rate (OR 4.04; 95% CI 3.45–4.72; $P < 0.01$; $I^2 = 59\%$), and symptom-severity score (OR – 4.02; 95% CI 0.82, 7.22; $P = 0.01$; $I^2 = 0\%$) compared to MYO at a four-year follow-up. However, UAE was associated with a lower rate of early complications (OR 0.44; 95% CI 0.20–0.95; $P = 0.04$; $I^2 = 25\%$), and readmission rate (OR 1.16; 95% CI 1.01–1.33; $P = 0.04$; $I^2 = 0\%$) compared to MYO. Furthermore, both procedures had comparable improvement in pregnancy rates and abnormal uterine bleeding. In conclusion, UAE and MYO are effective in treating symptomatic UFs but they have different outcomes. The decision on which procedure to choose should be made based on individual preferences and the physician's expertise.

Keywords Uterine artery embolization, Myomectomy, Symptomatic uterine fibroids, Meta-analysis

Uterine fibroids, also known as myomas, are the most common benign tumors affecting women during their reproductive years, with prevalence increasing with age[1,2]. Symptoms of fibroids, such as heavy menstrual bleeding, abdominal pain, and pressure[3], can have a negative impact on quality of life[4,5]. Surgical treatments such as hysterectomy and myomectomy (MYO) remain the conventional choices for managing fibroids. However, a minimally invasive treatment, uterine artery embolization (UAE), has emerged as an alternative to hysterectomy, which has been in practice since 1995[6]. UAE is now often used as an elective treatment for symptomatic UFs due to its safety and ability to improve symptoms with few major complications[7]. For those who desire to preserve their uterus, MYO is typically the standard of care, but there is uncertainty regarding the optimal treatment choice. Therefore, this paper aimed to systematically review and meta-analyze all relevant studies to compare the outcomes of UAE and MYO treatments for the management of uterine fibroids.

Methods

This meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement[8], involves two independent investigators undertaking the literature search, selection, and data extraction in duplicate, ensuring the integrity of the research process. In the event of any

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discrepancy arising between these investigators, a third investigator was consulted to resolve any differences by reaching consensus, underscoring the rigorous quality control measures implemented in this study.

Search strategy

Relevant studies, before November 2023, were identified by searching PubMed, Embase, Medline, and the Cochrane Library for English-language studies related to uterine fibroids and leiomyomas, including myomectomy and embolization. The search was conducted without any restrictions on the length of follow-up. As part of the literature search process, the findings of relevant studies and review papers were also manually searched for additional references.

Criteria for studies selection

Studies and comparison. This study compared the outcomes of symptomatic UFs when treated with UAE and MYO approaches using randomized controlled trials (RCTs) or cohort studies, with a sample size of at least 10 patients in each group.

Types of participants. Premenopausal women aged 18 or above who are experiencing symptoms of UFs and require treatment.

Types of interventions. UAE or MYO.

Other situations. In the event, that multiple studies had been conducted by the same or different authors, utilizing the same case series but with varying follow ups, and the case series being overlapped among the studies, the studies with the largest sample size were included for review.

Types of outcomes. Data were collected using a pre-designed abstraction form. The targeted data included the study design, country, intervention details (Uterine Artery Embolization and Myomectomy), sample size, follow-up time, and Newcastle–Ottawa Scale (NOS) score. Primary outcomes assessed were the health-related quality-of-life (HRQOL) score (scores ranging from 0 to 100, with higher scores indicating better quality of life), symptom severity score (SSS, scores ranging from 0 to 100, with higher scores indicating increased severity) and reintervention (including myomectomy, uterine artery embolisation, endometrial ablation, hysterectomy, transcervical resection). Secondary outcomes included the number of pregnancies (gravidity, live birth, miscarriage, or termination), menstrual bleeding (amenorrhea, light, normal and heavy). Early postoperative major adverse events were monitored during the first 30 days after surgery, including severe vaginal bleeding, blood transfusion, rehospitalization, wound complications after myomectomy, surgical intervention due to hematoma or infection, and hysterectomy. Hospital stay was defined as the time spent from admission to discharge for the first surgery. Readmission refers to the necessity of being readmitted due to post-discharge complications that arise from the initial surgery. Primary costs are associated with the first surgical expenses including nursing care, radiology or operating room utilization of anesthesia services and supplies. The loss of menstrual blood in the enrolled studies was measured according to the PBAC[9]. Score ranged from 0 (no bleeding) as a minimum but had no fixed upper limit. This is a validated and well-used assessment of the loss of menstrual blood in women with uterine fibroids. A score of 100 is usually considered to be excessively heavy bleeding.

Quality assessment

Two authors independently assessed the quality and risk of bias of the studies included via the NOS[10] and the Cochrane risk of bias tool[11]. The NOS was applied to observational cohort studies, evaluating the selection of cohorts, the comparability of groups, the adequacy of outcome assessment, and the reporting, with a score of 7 being considered of high quality. The Cochrane risk of bias tool was used to evaluate the quality of the randomized controlled trials (RCT) that were included in the review.

Statistical analysis

The results of our meta-analysis were reported as odds ratios (ORs) or mean differences (MDs) with 95% confidence intervals (CIs) for both dichotomous and continuous variables. Interstudy heterogeneity was assessed using the Cochran Q statistic ($\chi 2$ test)[12], along with the I2 statistic as a measure describing degrees of heterogeneity[13]. I^2 value ranging from 0 to 100%. A value of 0–24% indicated no heterogeneity, 25–49% indicated moderate heterogeneity, 50–74% indicated a high level of heterogeneity, and 75–100% indicated extreme heterogeneity. Sensitivity analysis and subgroup analysis were conducted to assess the reliability of a high-heterogeneity result. All analyses were done using Review Manager Software 5.1.20, and a two-sided $P < 0.05$ was regarded as statistically significant.

Results

Study selection and characteristics

The literature search yielded 4998 results. After the removal of duplicates, reviews and case reports, 1124 results remained for title and abstract screening, resulting in the selection of 55 studies for full-text assessment. Of these, 17 published papers including thirteen cohort studies[13–29] met the defined inclusion criteria and compared the UAE and MYO groups. Figure 1 shows the flow diagram of study selection.

The Table 1 presented the characteristics of the included studies, which comprised of four RCTs[14–21], two prospective cohorts[22,28] and seven retrospective studies[23–27,29,30]. The sample size of the studies ranged from 80 to 18,433 participants. According to the NOS assessment, five studies[20,22,23,25,26] were rated eight-stars and four studies[21,22,26,29] were rated seven-stars. The four RCTs were considered high-quality studies The quality of evidence for all outcomes was above medium.

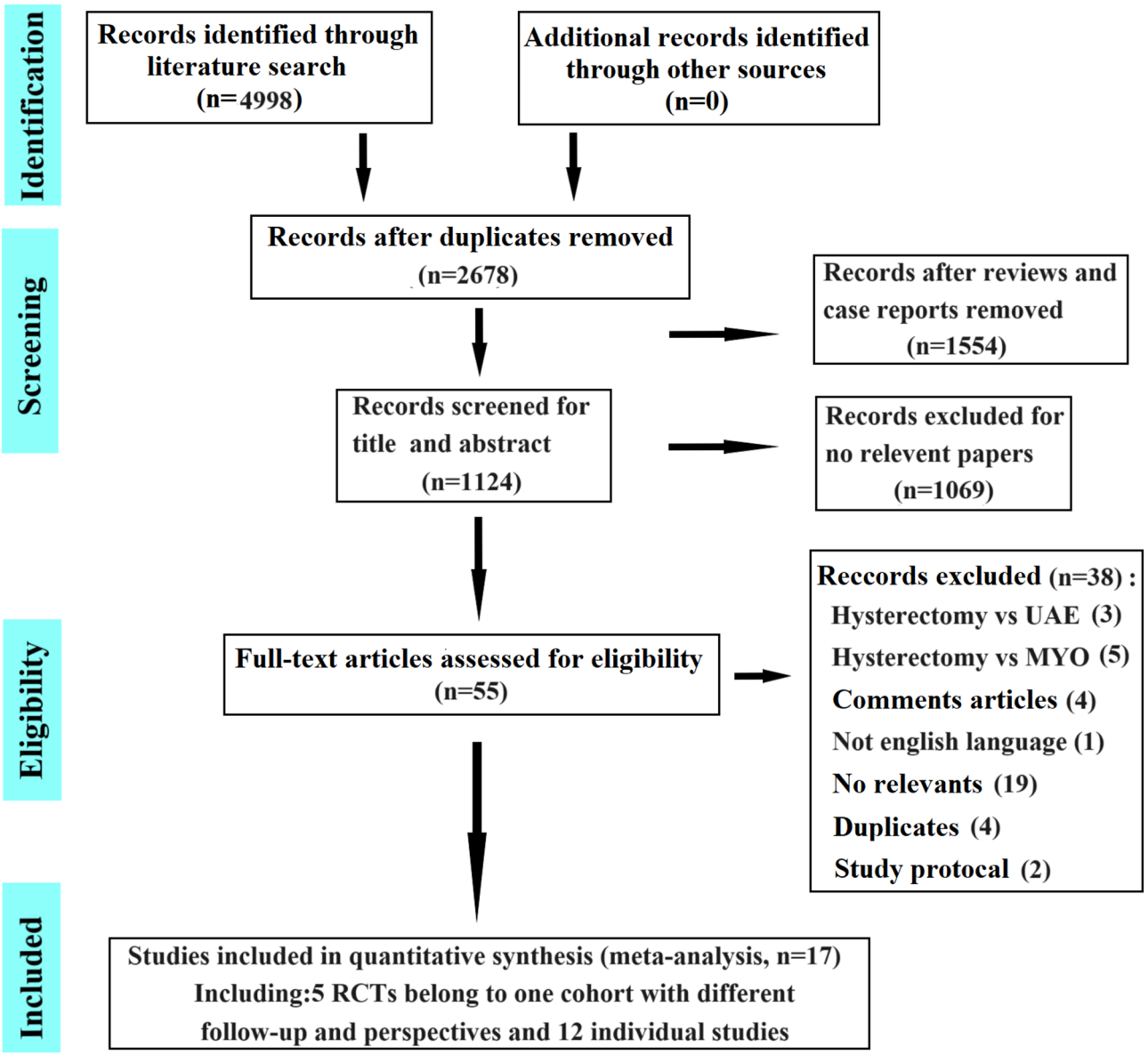

Figure 1. Flow diagram for study identification and inclusion.

Patients' characteristics

The baseline characteristics of patients between the UAE and MYO groups were compared in Table 2. The mean age of the patients in the UAE group was 43.3 years, while it was 39.5 years in the MYO group. The racial composition of the UAE group was 40.9% white and 24.3% black, while the MYO group had 32.9% white and 35.4% black. A small proportion of patients in both groups had subfertility (UAE, 13.1%; MYO, 15.1%) and pelvic pain (UAE, 24.5%; MYO, 12.1%). Bleeding symptoms were present in 38.7% of the UAE group and 38.8% of the MYO group. The location of the largest fibroid was submucosa in 9.4% of the UAE group and 11.2% of the MYO group, subserosa in 29.3% of the UAE group and 27.3% of the MYO group, and intramural in 21.7% of the UAE group and 32.1% of the MYO group. The number of fibroids was 1–3 in 56.2% of the UAE group and 58.3% of the MYO group, 4–10 in 25.3% of the UAE group and 31.5% of the MYO group, and > 10 in 29.3% of the UAE group and 12.1% of the MYO group. The gravidity rate was 86.9% in the UAE group and 78.8% in the MYO group. The mean uterine volume was 796.6 cm3 in the UAE group and 731.7 cm^3 in the MYO group.

Early outcomes

Outcome measured in hospitalization or predischarge are summarized in detail in Table 3. The meta-analysis found that some outcomes in the UAE group were significantly lower than the MYO group including early major complications within 30 days after discharge (OR 0.44; 95% CI 0.20–0.95; $P = 0.04$; heterogeneity: $I^2 = 25\%$)[15,18,20], readmission due to complication after discharge (OR1.16; 95% CI 1.01–1.33; $P = 0.04$; heterogeneity: $I^2 = 0\%$)[15,18,20,24], hospital stay (MD, – 47.07; 95% CI – 58.94 to – 35.2; $P < 0.01$; heterogeneity: $I^2 = 87\%$)[20,22,23,30] and primary cost around first surgery (MD, – 47.56; 95% CI – 53.27 to – 41.85; $P < 0.01$; heterogeneity: $I^2 = 65\%$)[15,18,20]

Study		Country	Design	Sample Size		Follow-up (month or year)		Patients	NOS
			UAE	MYO		UAE	MYO		
FEMME trial	Rana,2021			127	127	48 m		Premenopausal women	–
	Daniels,2022	UK 29 Hospital	RCT			48 m			
	Manyonda,2020					24 m			
	Daniels,2022					24 m			
	Sirkeci,2022					24 m			
Unnamed	Allameh,2022	Iran	RCT	40	40	12 m		Premenopausal women	–
FUME trial	Manyonda,2012	UK	RCT	63	59	12 m		Premenopausal women	–
Unnamed	Mara,2007	Czech	RCT	58	63	26.2 m	23.7 m	Premenopausal women	–
	Anchan,2023	USA	Prospective	176	509	3 y		Premenopausal women	8
	Haya,2002	Canada	Retrospective	85	91	In hospital		Premenopausal women	7
	Amoah,2023	UK	Retrospective	6224	9443	7y		Premenopausal women	8
	Broder,2002	USA	Retrospective	51	30	46 m	49 m	Premenopausal women	8
	Davis,2018	USA	Retrospective	4629	13,804	12 m		Premenopausal women	7
	Goldberg,2006	USA	Retrospective	136	105	12 m		Premenopausal women	8
	Goodwin,2006	USA	Prospective	149	60	12 m	6 m	Premenopausal women	7
	Narayan, 2010	USA	Retrospective	87	98	5.5y	5.3y	Premenopausal women	7
	Razavi,2002	USA	Retrospective	62	40	14.3 m	14.6 m	Premenopausal women	8

Table 1. Details of included studies of patients with uterine fibroids treated by UAE or MYO. *Nos* Newcastle–Ottawa Scale, *UAE* Uterine Artery Embolization, *MYO* Myomectomy.

Variable	No. of studies	UAE group, % (n/N)	MYO group, % (n/N)
No. of patients	9	11,887	24,469
Age, years	8	43.3	39.5
Race			
White	4	40.9% (2698/6587)	32.9% (3320/10,087)
Black	4	24.3% (1601/6587)	35.4% (3573/10,087)
Other	4	34.8% (2288/6587)	31.3% (3194/10,087)
Subfertility	3	13.1% (650/4954)	15.1% (2158/14,373)
Pelvic pain	3	24.5% (399/1623)	12.1% (16,700/5619)
Bleeding symptoms	3	38.7% (1918/4954)	38.8% (5579/14,373)
Largest fibroid's location			
Submucosa	2	9.4% (26/276)	11.2% (21/187)
Subserosa	2	29.3% (81/276)	27.3% (51/187)
Muscle wall	2	21.7% (60/276)	32.1% (60/187)
No. of fibroids			
1–3 no. (%)	2	56.2% (155/276)	58.3% (109/187)
4–10 no. (%)	2	25.3% (70/276)	31.5% (59/187)
> 10 no. (%)	2	29.3% (81/276)	12.1% (19/187)
Gravidity	3	86.9% (298/343)	78.8% (526/676)
Uterine volume, cm^3	4	796.6	731.7

Table 2. Patients' characteristics. *UAE* Uterine Artery Embolization, *MYO* Myomectomy.

Early outcomes	Study number	Events/Simple Size		Statistical Method	Effect Estimate [CI]	Heterogeneity (I^2)	Overall effect
		UAE	MYO				
Complications	2	8/185	19/190	Odds Ratio (M-H, Fixed, 95% CI)	0.41 [0.18, 0.96]	42%	P = 0.04
Delay discharge	2	11/185	6/190	Odds Ratio (M-H, Fixed, 95% CI)	2.05 [0.74, 5.68]	0%	P = 0.17
Readmission	3	376/6409	495/9633	Odds Ratio (M-H, Fixed, 95% CI)	1.16 [1.01, 1.33]	0%	P = 0.04
Hospital stays	4	–	–	Mean Difference (IV, Random, 95% CI)	−47.07 [−58.94, −35.20]	87%	P < 0.01

Table 3. Early outcomes for patients with UFs treated by UAE or MYO before discharge. *UFs* Uterine Fibroids, *UAE* Uterine Artery Embolization, *MYO* Myomectomy.

However, there was no significant difference between the UAE group and the MYO group in delayed discharge (OR 2.05; 95% CI 0.74–5.68; $P = 0.17$; heterogeneity: $I^2 = 0\%$)[15,18,20].

Long-term outcomes

Pregnancy condition

Table 4 indicated that there was no significant difference in the gravidity(Pregnancies) rates (OR 0.89; 95% CI 0.18–4.49; $P = 0.88$; heterogeneity: $I^2 = 55\%$)[17,18,20], live birth (OR 0.62; 95% CI 0.12–3.07; $P = 0.56$; heterogeneity: $I^2 = 75\%$)[17,18,20], miscarriage (Non-induced labor) (OR 2.43; 95% CI 0.90–6.54; $P = 0.08$; heterogeneity: $I^2 = 13\%$)[17,18,20] and termination (Induced labor) (OR 1.04; 95% CI 0.15–7.49; $P = 0.97$; heterogeneity: $I^2 = 0\%$)[17,18,20] between the UAE group and the MYO group.

Abnormal uterine bleeding

The analysis of the original data revealed that the incidence of abnormal uterine bleeding was improved from pre-operation to post-operation[16,21], such as amenorrhea (0.4–17.2%), light (1.4–42.5%), normal (30.9–29.3%) and heavy (67.4–12.1%). However, the synthesized outcomes indicated that there was no significant difference between the UAE group and the MYO group in terms of amenorrhea (OR 0.80; 95% CI 0.35–1.84, $P = 0.60$; Heterogeneity: $I^2 = 0\%$), light (OR 1.83; 95% CI 0.58–5.80, $P = 0.31$; Heterogeneity: $I^2 = 0\%$), normal (OR 0.50; 95% CI 0.05–4.72, $P = 0.55$; Heterogeneity: $I^2 = 59\%$) and heavy (OR 0.96; 95% CI 0.38–2.42; $P = 0.93$; Heterogeneity: $I^2 = 0\%$) at the end of follow-up (Table 5).

Reintervention

Figure 2 demonstrates that the rate of reintervention was significantly higher in the UAE group than in the MYO group during 1-year, 2-year and 4-year follow-up (OR 1.77; 95% CI 1.54–2.04, $P < 0.01$; Heterogeneity: $I^2 = 0\%$; OR 3.44; 1.52–7.77, $P < 0.01$; Heterogeneity: $I^2 = 67\%$; OR 1.84; 95% CI 1.62–2.10, $P < 0.01$; Heterogeneity: $I^2 = 39\%$, respectively). Furthermore, a meta-analysis of the re-intervention events revealed that women in the UAE group were at a significantly greater risk of hysterectomy than those in the MYO group during 1-year, 2-year and 4-year follow-up (OR 2.67; 95% CI 2.18–3.25, $P < 0.01$; Heterogeneity: $I^2 = 37\%$; OR 4.06; 95% CI 3.31–4.9, $P < 0.01$; Heterogeneity: $I^2 = 16\%$; OR 4.04; 95% CI 3.45–4.72, $P < 0.01$; Heterogeneity: $I^2 = 59\%$, respectively) (Fig. 3).

UFs scores for quality of life (QOL) and symptom severity

The results of the UFs questionnaire score have been a crucial factor in assessing the quality of life and symptom severity in women with UFs[30–32]. According to the data, there is no significant difference between the UFs treated with UAE or MYO in terms of improvement of QOL at two-year and four-year follow-up (OR − 0.56;

Pregnancy	Study number	Events/Simple Size		Statistical Method	Effect Estimate	Heterogeneity (I^2)	Overall effect
		UAE	MYO				
Gravidity	2	29/185	38/190	Odds Ratio (M–H, Random, 95% CI)	0.89 [0.18, 4.49]	55%	P = 0.88
Live birth	2	12/185	21/190	Odds Ratio (M–H, Random, 95% CI)	0.62 [0.12, 3.07]	75%	P = 0.56
Miscarriage	2	12/185	21/190	Odds Ratio (M-H, Fixed, 95% CI)	2.43 [0.90, 6.54]	13%	P = 0.08
Termination	2	2/185	2/190	Odds Ratio (M–H, Fixed, 95% CI)	1.04 [0.15, 7.49]	0%	P = 0.97

Table 4. Pregnant outcomes after patients withUFs treated by UAE or MYO. *UFs* Uterine Fibroids, *UAE* Uterine Artery Embolization, *MYO* Myomectomy.

Menstrual Bleeding	Study number	Events/Simple Size		Statistical Method	Effect Estimate	Heterogeneity (I^2)	Overall effect
		UAE	MYO				
Baseline							
Amenorrhea	2	0/142	1/140	Risk Difference (M–H, Fixed, 95% CI)	−0.01 [−0.03, 0.02]	0%	P = 0.54
Light	2	0/142	4/140	Odds Ratio (M–H, Fixed, 95% CI)	0.19 [0.02, 1.65]	0%	P = 0.13
Normal	2	51/142	36/140	Odds Ratio (M–H, Random, 95% CI)	1.40 [0.53, 3.72]	67%	P = 0.50
Heavy	2	91/142	99/140	Odds Ratio (M–H, Random, 95% CI)	0.90 [0.27, 2.98]	78%	P = 0.87
Follow-up							
Amenorrhea	2	15/91	15/83	Odds Ratio (M–H, Fixed, 95% CI)	0.80 [0.35, 1.84]	0%	P = 0.60
Light	2	31/91	35/83	Odds Ratio (M–H, Fixed, 95% CI)	1.83 [0.58, 5.80]	0%	P = 0.31
Normal	2	26/91	25/83	Odds Ratio (M–H, Fixed, 95% CI)	0.50 [0.05, 4.72]	59%	P = 0.55
Heavy	2	11/91	10/83	Odds Ratio (M–H, Fixed, 95% CI)	0.96 [0.38, 2.42]	0%	P = 0.93

Table 5. Menstruation outcomes before or after UFs treated by UAE or MYO. *UFs* Uterine Fibroids, *UAE* Uterine Artery Embolization, *MYO* Myomectomy.

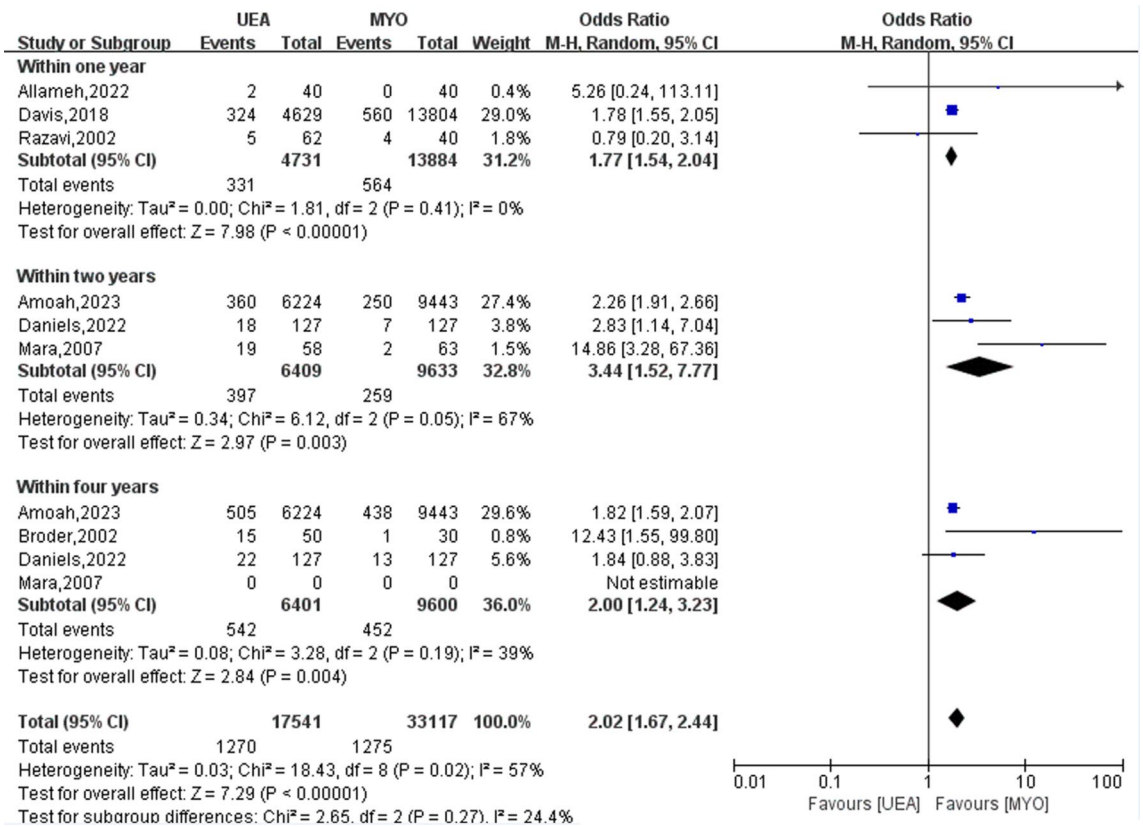

Figure 2. Forest plot indicating the rate of reintervention after Uterine Artery Embolization (UAE) and Myomectomy (MYO) in the management of Uterine Fibroids (UFs) with different follow-ups. The solid squares denote the Odds Ratio (OR), the horizontal lines represent the 95% confidence intervals (CIs), and the diamonds denote the pooled effect sizes.

95% CI − 7.33 to 6.22, $P = 0.87$; Heterogeneity: $I^2 = 78\%$; OR − 2.42; 95% CI − 5.31 to 0.48, $P = 010$; Heterogeneity: $I^2 = 0\%$)[18,22] (Fig. 4). However, the fixed-effects model indicated, in Fig. 5, that the UAE group had significantly higher scores of symptom severity compared to the MYO group at two-year and four-year follow-up (OR 2.13; 95% CI 0.41–3.85, $P = 0.02$; Heterogeneity: $I^2 = 0\%$; OR − 4.02; 95% CI 0.82, 7.22, $P = 0.01$; Heterogeneity: $I^2 = 0\%$)[18,22].

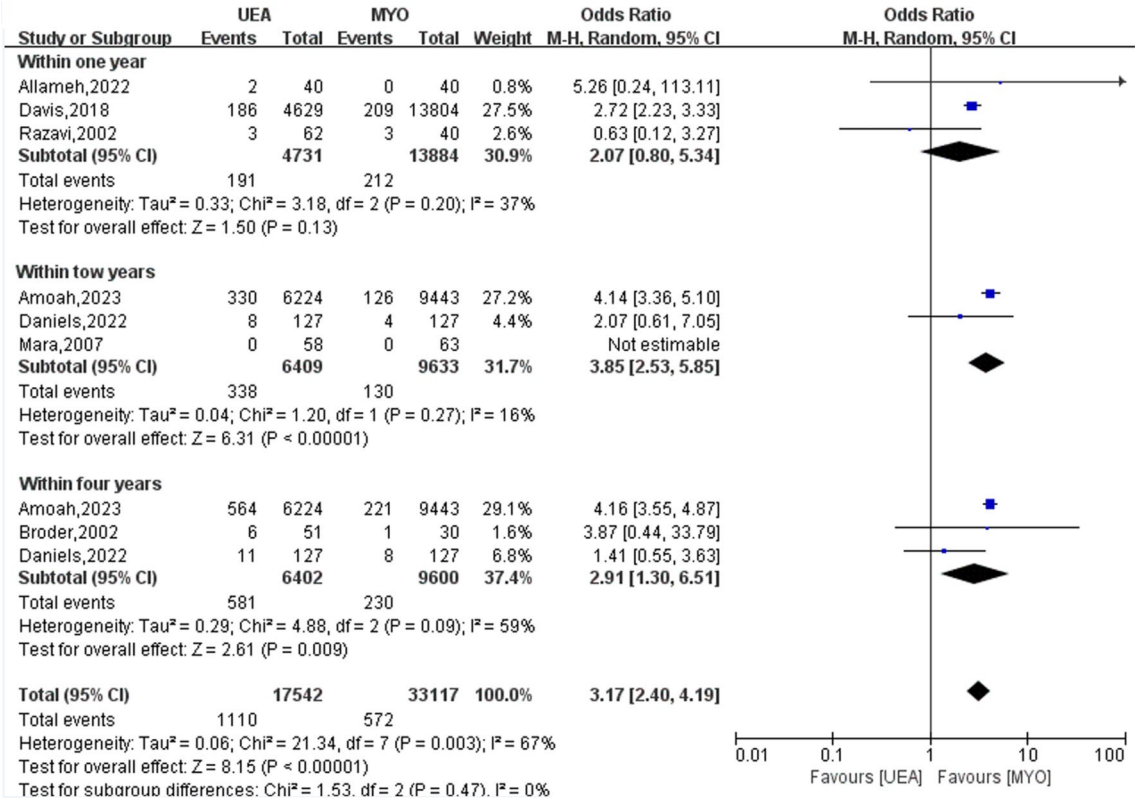

Figure 3. Forest plot indicating the rate of hysterectomy after Uterine Artery Embolization (UAE) and Myomectomy (MYO) in the management of Uterine Fibroids (UFs) with different follow-ups. The solid squares denote the Odds Ratio (OR), the horizontal lines represent the 95% confidence intervals (CIs), and the diamonds denote the pooled effect sizes.

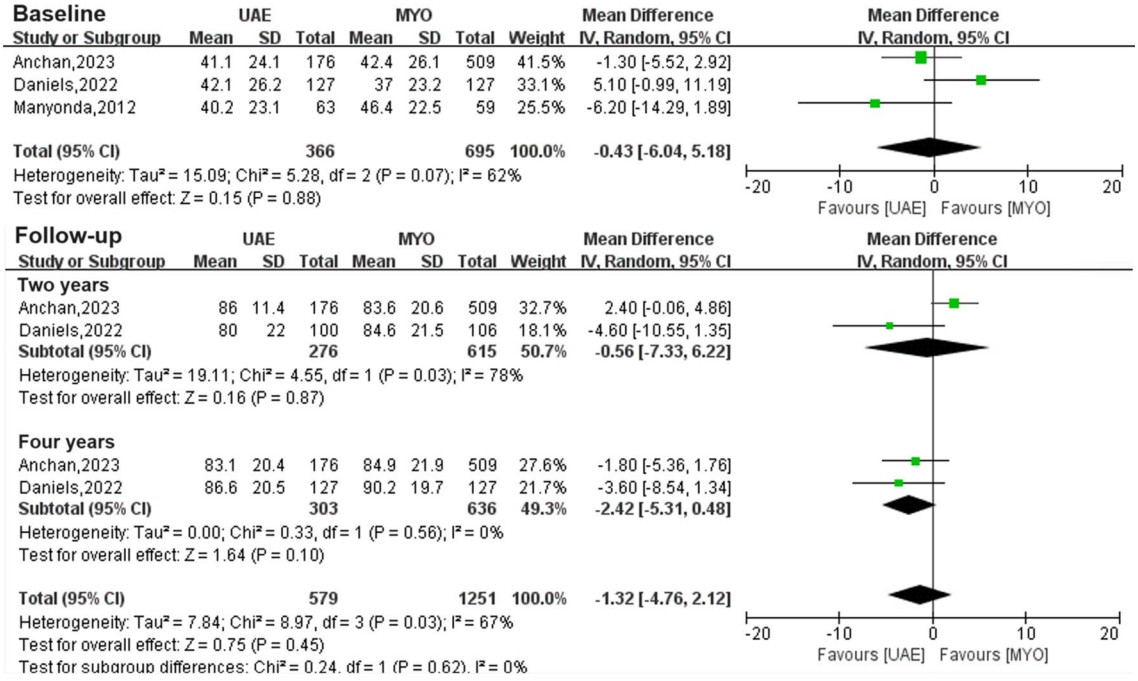

Figure 4. Forest plot indicating scores for health quality of life in different follow-ups after Uterine Artery Embolization (UAE) and Myomectomy (MYO) in the management of Uterine Fibroids (UFs). The solid squares denote the mean differences (MD), the horizontal lines represent the 95% confidence intervals (CIs), and the diamonds denote the pooled effect sizes.

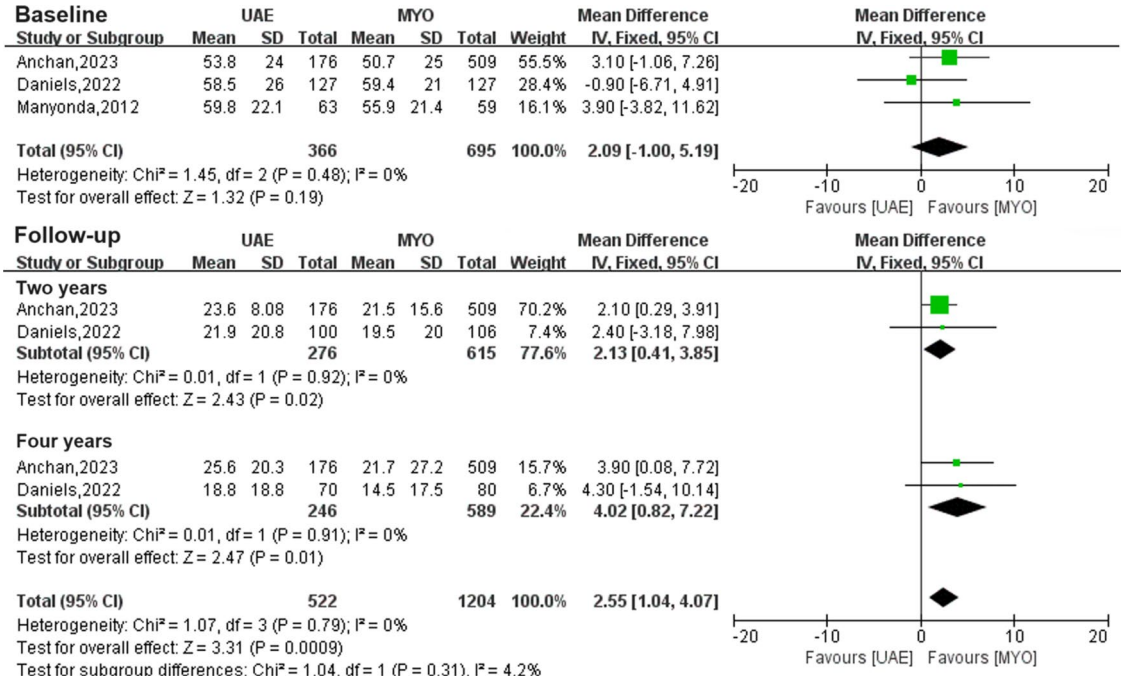

Figure 5. Forest plot indicating scores for syndrome severity in different follow-ups after Uterine Artery Embolization (UAE) and Myomectomy (MYO) in the management of Uterine Fibroids (UFs). The solid squares denote the mean differences (MD), the horizontal lines represent the 95% confidence intervals (CIs), and the diamonds denote the pooled effect size.

Discussion

Our systematic review of thirteen cohorts, including four randomized controlled trials, is the largest meta-analysis to date to compare short- and long-term outcomes of uterine artery embolization (UAE) and myomectomy (MYO) for the treatment of uterine fibroids (UF). Our findings indicate that UAE is associated with a significant advantage over MYO in terms of early complications, rehospitalization, hospital stays, and hospitalization expenses. However, UAE may have some disadvantages compared to MYO in terms of long-term outcomes such as reintervention, hysterectomy, and improvement in syndrome severity.

Previous meta-analysis suggested UAE had lower rates of major complications with an increased risk of re-intervention after the first procedure compared to MYO[33]. However, the review incorporates hysterectomized patients, potentially biasing in favor of endovascular procedures. The quality of evidence was low due to outdated RCTs, and some outcomes were unaccounted for[34]. Contrarily, this new analysis includes more comprehensive outcomes with quality assessed as high based on most high-quality RCT and observational studies.

Patients'characteristics

Table 2 reflects almost twice as many whites compared to blacks in the UAE group. This observation may be related to a study conducted in the UK[24], which involved 2598 white individuals and 1424 black individuals in the UAE group. This difference could be influenced by the national circumstances in Britain. Moreover, we found that Table 2 reflects the differences more than twice as much between UAE and MYO when No. Fibroids > 10. There are two studies describing racial proportions. One study[28] included 75 UAE and 13 MYO patients with uterine fibroids greater than 10. The possible reason is that too many uterine fibroids undergoing MYO surgery will cause more damage to the uterus.

Early outcomes

Our meta-analysis found fewer early major complications and shorter hospital stays for UAE-treated women, consistent with a prior study[35]. Yet the pooled hospital-stay result exhibits high heterogeneity ($I^2 = 87\%$) in Table 3. A sensitivity analysis, omitting the poorer designed study[21], found that UAE stays remain significantly shorter than MYO's (MD, − 47.98; 95% CI − 48.80 to − 47.17; $P < 0.01$; heterogeneity: $I^2 = 0\%$). For readmissions, Amoah[24] reported a bigger discrepancy in MYO vs. UAE. However, two studies[17,19] presented similar morbidities. Pooled results indicated higher readmission rates in MYO ($I^2 = 0\%$), potentially due to the minimally invasive nature of UAE.

Long-term outcomes

Table 5 results show no significant differences between newborns ($I^2 = 55\%$), live births ($I^2 = 75\%$), miscarriages ($I^2 = 13\%$) or terminations ($I^2 = 0\%$) in the two groups. We obtained these data from two RCTs[18,20]. The variety could be due to varying follow-up times, research centers and number of studies. Menstrual bleeding rates

across all types showed no significant differences over time, but heavy bleeding had high heterogeneity ($P = 0.03$, $I^2 = 78\%$). This data came from two RCTs[18,21]. The heterogeneity could be tied to different follow-up periods, study centers and fewer studies. For those opting for uterine preservation, the reintervention risks were key in deciding treatment. A prior study determined no statistical difference after two years of follow-up[36]. However, our meta-analysis in Fig. 2 revealed that UAE had a higher re-intervention rate compared to MYO over one, two, and four years (7.0% vs 4.1%, 6.2% vs 2.7%, and 8.5% vs 4.7%, respectively), with 57% total heterogeneity. Our aggregate result came from two RCTs and one retrospective study, despite the 67% heterogeneity in the two-year follow-up. A sensitivity analysis removing one study[20] resulted in a consistent re-intervention (OR 2.27; 95% CI 1.9–2.67; $P < 0.05$; heterogeneity: $I^2 = 0\%$). Our analysis also showed that UAE had a higher hysterectomy rate (4% vs 1.5%, 5.2% vs 1.3%, and 9.1% vs 2.3%) at 1, 2, and 4-years follow-up, with 67% total heterogeneity. A sensitivity analysis showed MYO maintained a significant advantage in reducing hysterectomy rates (OR 4.00; 95% CI 3.54–4.53; $P < 0.01$; heterogeneity: $I^2 = 45\%$) than UAE. Both treatments had no significant difference for QOL improvement at 2 and 4-years follow-up, but MYO proved superior in symptom alleviation at 2 and 4-years follow-up. Past studies have reported similar results[19,37], but our study had a longer follow-up duration, which may have affected the findings.

Limitations for our meta-analysis exist. First, the outcomes are tied to time, so variation in follow-up length might affect late-occurring events. Second, most of these studies were observational. More matched studies are needed for specific patient groups. Third, outcomes were inconsistent among papers, limiting the quantity of articles to synthesize, potentially introducing selection bias.

Conclusion

UF patients choosing UAE treatment can evade perioperative complications, shorter hospital-stay and fewer re-admissions, but face a heightened risk of hysterectomy and extra surgery upon long-term follow-up. Ultimately, considering personal expectations is pivotal when making treatment decisions.

Data availability

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

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J.W.P., J.W., Z.J.L.: Conception and design. J.W., Z.J.L.: Analysis and interpretation. Q.J.S., Y.L., S.W.: Data collection. J.W.P., J.W.: Writing the article. J.W., J.W.P., Z.J.L.: Critical revision of the article. J.W., J.W.P., Q.J.S., Z.J.L., Y.L., S.W.: Final approval of the article. J.W., Z.J.L.: Statistical analysis. J.W.P., J.W.: Obtained funding J.W.P., Overall responsibility.

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Competing interests

The authors declare no competing interests.

Additional information

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