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Uterine artery embolization: A review of current concepts

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A B S T R A C T

Uterine artery embolization (UAE) has gained traction as a safe and effective treatment modality for symptomatic uterine leiomyomata since its introduction nearly two decades ago. This review includes an overview of current concepts with regard to patient selection, technique, and outcomes following UAE. Specific topics also include the impact of this procedure on fertility and pregnancy, the emerging role of UAE in the treatment of adenomyosis, and how UAE compares with surgical intervention for the treatment of symptomatic leiomyomata.

Introduction

In recent years, mainstream treatment of uterine leiomyomata has expanded to include minimally invasive treatment modalities such as uterine artery embolization (UAE). Annually, over 25,000 UAE procedures are performed worldwide [1]. Although the number of more traditional surgical interventions such as hysterectomy and myomectomy dwarf those of UAE, over two decades of published literature have confirmed the safety and efficacy of UAE for treating uterine leiomyomata. Current ACOG clinical management guidelines support the use of UAE as a treatment option for patients who wish to retain their uteri [2]. The objectives for this article are to inform healthcare providers about UAE through an overview of how patients are evaluated for UAE, procedural technique, and a review of current literature regarding this procedure.

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Patient selection

As with any procedure, careful patient selection is paramount. Ideal candidates for uterine artery embolization include patients with symptomatic fibroids who wish to retain their uterus and/or avoid surgical intervention. Symptoms of uterine leiomyomata may include menorrhagia and/or metrorrhagia; bulk symptoms manifesting as pelvic pain, fullness, or bloating; dyspareunia; severe cramping; urinary urgency, frequency, or retention; or hydronephrosis secondary to an enlarged uterus. Treatment of adenomyosis using UAE is gaining traction and is further detailed in a dedicated section below. Absolute contraindications include pregnancy, active untreated infection, and suspected gynecologic malignancy unless being treated for palliation or adjunct to surgery. Contrast allergy, coagulopathy, desire for future fertility, and renal impairment are relative contraindications.

At the initial clinic visit, patients should receive a comprehensive history and physical examination, recent gynecologic examination by an OB/GYN, and documentation of recent Pap smear and endometrial biopsy in instances of abnormal uterine bleeding. Current diagnostic imaging should also be reviewed, with magnetic resonance imaging (MRI) as the imaging modality of choice for evaluating uterine anatomy and excluding non-leiomyomata etiologies of pelvic pain and abnormal uterine bleeding [3]. It is often suggested that pelvic ultrasound is sufficient for evaluation; however, those specializing in UAE will advocate the critical nature of having a contrast-enhanced MRI to understand the benefit of UAE for a particular patient. MRI can provide information on whether there is contrast enhancement of the uterine fibroids, how the location of the fibroids correlates with the patient's symptoms, presence of potential malignancy, the likelihood of fibroid passage as determined by location/attachment, and as a baseline to show that post-procedure necrosis is achieved. The gathering of this information allows the patient to make an informed decision regarding their procedure choice, if any. Location of leiomyomata relative to the uterus is an additional consideration, specifically with regard to submucosal and pedunculated serosal leiomyomata. Submucosal fibroids should be evaluated on imaging for potential of intracavitary migration and subsequent expulsion [4]. A study by Verma et al. found that submucosal fibroids with a larger ratio of endometrial interface to largest fibroid dimension were more likely to become completely or partially intracavitary [5]. A recent study by Lacayo et al. found that pedunculated serosal fibroids were less likely to demonstrate complete infarction following UAE [6].

The expected outcomes following UAE for treatment of uterine leiomyomata include 50–60% reduction in leiomyomata size, 40–50% in uterine size, 88–92% reduction in bulk symptoms, and greater than 90% elimination of abnormal uterine bleeding [7]. Appropriate counseling for the potential risks of UAE to include bleeding, infection, renal impairment from intravascular contrast administration, impact on fertility, and possibility of requiring surgical intervention should be performed. Data supporting the latter risks is detailed in dedicated sections below.

Technique

The goal of uterine artery embolization is to promote reduction in the size of uterine leiomyomata by injecting small particles in the uterine arteries following selective catheterization. While specific techniques may differ slightly by institution, the procedure is essentially performed in similar fashion. Patients undergo routine pre-operative preparation to include fasting for at least 6 h, laboratory evaluation of coagulation parameters (platelets $\geq$ 50,000/μL, INR $\leq$ 1.5) and renal function, and premedication for documented history of contrast allergy. Moderate sedation is typically utilized for the procedure, except in rare circumstances.

Entry into the arterial system is usually obtained via unilateral or bilateral common femoral artery access, with subsequent placement of 5- or 6-French vascular sheaths. There is growing support for unilateral radial arterial access, as it may be associated with faster recovery times and better patient tolerance [8,9]. The uterine arteries are then selected with a 4- or 5-French catheter or coaxial microcatheter. Catheters are typically positioned in the horizontal segment of the uterine artery several centimeters away from its origin to prevent reflux into distal internal iliac arterial branches and potential cervicovaginal branches. Embolization is performed with polyvinyl alcohol or tris-acyl gelatin particles (500 μm–1000 μm diameter per particle) to near-stasis of the uterine arteries. Slow infusion of intra-

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