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Efficacy of Ovarian Artery Embolization for Uterine Fibroids: Clinical and Magnetic Resonance Imaging Evaluations

Jennifer Campbell, MPH, Dheeraj K. Rajan, MD, John R. Kachura, MD, Jeffrey Jaskolka, MD,
J. Robert Beecroft, MD, Kenneth W. Sniderman, MD, Martin E. Simons, MD, Kong T. Tan, MD*

Division of Interventional Radiology, University Health Network, University of Toronto, Toronto, Ontario, Canada

Abstract

Purpose: The objective of the study was to assess the efficacy of ovarian artery embolization (OAE) treatment for symptomatic uterine leiomyomas.

Methods: A retrospective review of 17 patients who underwent OAE in conjunction with uterine artery embolization in a 6-year period (2006-2012) was performed. Ten patients had previous failed embolization, while 7 had not received any embolization therapy before. Percent uterine volume change, percent dominant fibroid volume change, and percent dominant fibroid infarction were assessed with magnetic resonance (MR) imaging. Resolution of menorrhagia, dysmenorrhea/pain, and bulk and/or pressure symptoms including urinary frequency were evaluated clinically. Change in menopausal state was also an outcome of interest.

Results: Mean MR imaging follow-up was performed 3 months post-OAE. MR images showed complete infarction in the majority of cases (64.7%; $n = 11$), with infarction rates of 90%-100% in 3 cases, 1 case with 30%-50% infarction, and 2 cases with 0%-10% infarction. Average uterine size reduction on MR was 32.3% (95% confidence interval [CI]: 22.5%-42.2%; $P < .001$). The average size reduction for the dominant fibroid was 42.4% (95% CI: 27.7%-57.0%; $P = .01$). The mean time to final follow-up visit was 11 months. At this point complete symptom resolution (menorrhagia, dysmenorrhea and bulk-related) was achieved in 82.4% ($n = 14$) of cases. At the final follow-up 11.8% ($n = 2$) of cases reported menopause.

Conclusions: We observed OAE to be an effective and safe adjunct to uterine artery embolization when hypertrophic ovarian artery(ies) require intervention. However, incomplete fibroid infarction of 23% remains a concern with a potential for long-term treatment failure. In addition, long-term effect on ovarian function is uncertain.

Résumé

Objet : L'étude avait pour objectif d'évaluer l'efficacité de l'embolisation des artères ovariennes dans le traitement des léiomyomes utérins symptomatiques.

Méthodes : Un examen rétrospectif portant sur 17 patientes ayant subi une embolisation des artères ovariennes et une embolisation des artères utérines sur une période de 6 ans (2006-2012) a été réalisé. Dix patientes avaient déjà subi une embolisation sans succès, alors que 7 n'avaient jamais reçu de traitement par embolisation. Le changement de volume utérin (en pourcentage), le changement de volume du fibromyome dominant (en pourcentage) et l'infarcissement du fibromyome dominant (en pourcentage) ont été déterminés au moyen de l'imagerie par résonance magnétique (IRM). La résolution de la ménorragie, de la dysménorrhée (et de la douleur) et des symptômes de gonflement ou de pression, y compris la fréquence de miction, a été évaluée sur le plan clinique. Les changements au chapitre de l'état ménopausique ont aussi été étudiés.

Résultats : En moyenne, l'examen d'IRM de suivi a été réalisé trois mois après l'embolisation des artères ovariennes. Les images ont révélé un infarcissement complet chez la plupart des patientes (64,7 %; $n = 11$) ainsi qu'un taux d'infarcissement de 90 à 100 % chez trois patientes, de 30 à 50 % chez une patiente et de 0 à 10 % chez deux patientes. L'IRM a également permis d'observer une réduction moyenne de la taille de l'utérus de 32,3 % (intervalle de confiance de 95 % : 22,5 %-42,2 %; $P < 0,001$) et une réduction moyenne de la taille du fibromyome dominant de 42,4 % (intervalle de confiance de 95 % : 27,7 %-57,0 %; $P = 0,01$). L'intervalle moyen avant la dernière visite de suivi était de

* Address for correspondence: Kong T. Tan, MD, Division of Interventional Radiology, University Health Network, University of Toronto, 585 University Avenue, PMB 1-293, Toronto, Ontario M5G 2N2, Canada.

E-mail address: kongteng.tan@uhn.ca (K. T. Tan).

11 mois. À cette étape, les symptômes (ménorragie, dysménorrhée et gonflement) avaient été entièrement résolus chez 82,4 % (n = 14) des patientes. Lors du dernier examen de suivi, 11,8 % (n = 2), des patientes ont par ailleurs signalé un état de ménopause.

Conclusions : Selon nos observations, l'embolisation des artères ovariennes s'est avérée un traitement d'appoint efficace et sécuritaire à l'embolisation des artères utérines en présence d'une ou de plusieurs artères ovariennes hypertrophiques exigeant une intervention. Toutefois, l'infarcissement incomplet du fibromyome chez 23 % des patientes demeure préoccupant en raison de l'éventuel échec du traitement à long terme. De plus, l'effet à long terme de l'embolisation sur la fonction ovarienne est incertain.

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Key Words: Uterine fibroid; Embolization; Gonadal artery; Magnetic resonance imaging

Uterine artery embolization (UAE) is an acceptable alternative to surgery in the treatment of symptomatic uterine leiomyomata [1]. Current evidence indicates that patients are more satisfied post-UAE compared to postsurgery (hysterectomy or myomectomy). However, UAE has an increased likelihood of requiring a surgical intervention within 2-5 years of the initial procedure [1]. One of the well-documented reasons for UAE failure is collateral supply to perfused fibroids via hypertrophic ovarian arteries [2–4]. In cases where 1 ovarian artery or both ovarian arteries are contributing to the fibroid's vascular supply, ovarian artery embolization (OAE) may be a minimally invasive alternative to surgical reintervention [3].

OAE is not formally accepted as a treatment option for symptomatic fibroids. The radiation exposure from additional imaging to identify hypertrophic arteries is a hypothesized risk of OAE [2,5]. It has also been postulated that OAE may lead to ovarian failure and premature menopause by impeding blood flow to the ovaries [5,6]. However, Hu et al. [7] have recently demonstrated that this may not necessarily occur.

There are limited studies describing outcomes of OAE with corresponding magnetic resonance (MR) findings. The first 2 publications were case reports of selective ovarian artery catheterization and successful embolization [6,8], followed by a report of 6 patients from the United States [9], and then a European study evaluating safety and effectiveness in a sample of 13 patients [10]. Here, we report our clinical experience and corresponding MR findings of 17 patients who received OAE and UAE.

Methods

Patients and Baseline Data Collection

Institutional review board approval was granted for this retrospective review of 17 patients who underwent OAE in a 6-year period (2006-2012). There were a total of 456 UAE cases in the same period. The clinical and imaging records of the women treated with OAE were reviewed.

Outpatient consultation notes were used to assess presenting symptoms which were categorized as menorrhagia, dysmenorrhea/pain, and bulk and/or pressure symptoms including urinary frequency. In addition, patient age, previous history of uterine fibroid interventions, menopausal state, and desire to preserve fertility were recorded.

The average age of the patients presenting for treatment of symptomatic fibroids patients in this study group was 45.1 years old (range 29-52 years old). Presenting symptoms included menorrhagia in 94.1% (n = 16), dysmenorrhea/pain in 58.8% (n = 10), bulk and/or pressure symptoms including urinary frequency in 76.5% (n = 13).

All patients had a baseline pre-embolization contrast agent-enhanced pelvic MR as well as pelvic ultrasound (US), which were reviewed. Uterine volume and dominant fibroid volume were recorded from both modalities according to the formula for a prolate ellipsoid [11,12]. Location and type of dominant fibroid was recorded as per UAE reporting standards based on multiplanar, multisequence imaging completed with and without intravenous gadolinium [13]. All MR images were obtained with a 1.5-T system (Excite; GE Medical Systems, Milwaukee, WI). After an initial localization scan was obtained, the following sequences were performed: axial T1-weighted fast spoiled gradient-echo imaging; sagittal T2-weighted fast spin-echo imaging; sagittal dynamic contrast-enhanced T1-weighted fast spoiled gradient-echo imaging at 0, 30, 60, 90 seconds after the administration of a gadolinium chelate; and axial delayed T1-weighted fast spoiled gradient-echo imaging.

In our institution, as part of our standard pretreatment clinical evaluation, all patients were asked if they would agree to ovarian artery embolization should an ovarian artery or arteries supplied the fibroids. They were each consulted about the risk of premature menopause from this procedure, in addition to infertility risk in the group of patients who wished to maintain fertility.

Embolization Technique

Informed consent was obtained from all patients. Sterile technique, local anaesthesia, and moderate intravenous sedation were used. Fellowship-trained interventional radiologists with 5-25 years' experience performed embolization procedures. Urinary bladder Foley catheter was placed routinely. Right common femoral artery access was obtained under sterile technique followed by insertion of a 5-F vascular sheath. Individual uterine artery was selected with Robert's uterine catheter (COOK Medical, Bloomington, IN). Polyvinyl alcohol (PVA) particles in 250-500 µm (COOK Medical) mixed with contrast was injected into the artery until flow stasis. Postembolization arteriogram was performed to

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