Laparoscopic Myomectomy Versus Uterine Artery Embolization: Long-Term Impact on Markers of Ovarian Reserve

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Abstract

Objective: To compare the relative long-term effects on ovarian reserve of treating fibroids in reproductive-aged women with uterine artery embolization (UAE) versus laparoscopic myomectomy (LM), using sensitive measures including antral follicle count (AFC) and serum anti-Müllerian hormone (AMH).

Methods: We undertook a retrospective cohort pilot study to evaluate the utility and feasibility of carrying out a larger prospective trial. Thirteen women were evaluated in this study, including eight in the UAE group and five in the LM group. They were identified from a larger group of 125 women who had undergone LM and 200 women who had undergone UAE at a participating institution at least 12 months previously; of these, 32 who had UAE and 27 who had LM were of reproductive age and eligible to participate. Participants had an assessment of ovarian reserve including measurements of serum AMH, estradiol, and FSH, and ultrasound assessment of AFC and ovarian volume.

Results: Median serum AMH levels were significantly lower in women who had undergone UAE at least 12 months previously than in women who had undergone LM (0.78 ng/mL [range 0.67 to 1.28] vs. 2.17 ng/mL [range 1.17 to 2.38], $P = 0.01$). Median AFC per ovary was also significantly lower in women who had UAE than in those who had LM (3.5 [range 2 to 7] vs. 7 [range 6 to 11], $P = 0.03$). Median levels of FSH and E_2 and of ovarian volume were not significantly different between the two groups.

Conclusion: Reproductive-aged women who have undergone treatment of fibroids with UAE may have lower ovarian reserve over the long term (> 12 months) than women with fibroids treated with LM. This could have an adverse impact on future response to fertility treatment and/or fecundity. This finding may inform the choice of minimally invasive treatment for fibroids in reproductive-aged women who have not completed childbearing. It suggests that further study in this area is warranted before the application of UAE is expanded to young reproductive-aged women.

Key Words: Uterine artery embolization, laparoscopic myomectomy, fibroid, myoma, ovarian reserve, AMH, antral follicle count

Competing Interests: None declared.

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Résumé

Objectif : Comparer, chez des femmes en âge de procréer, la prise en charge de fibromes par embolisation de l'artère utérine (EAU) à leur prise en charge au moyen d'une myomectomie par laparoscopie (ML), pour ce qui est des effets relatifs à long terme sur la réserve ovarienne (déterminés au moyen de mesures sensibles, dont la numération des follicules antraux [NFA] et le taux sérique d'hormone antimüllérienne [HAM]).

Méthodes : Nous avons mené une étude de cohorte rétrospective pilote afin d'évaluer l'utilité et la faisabilité de mener un essai prospectif de plus grande envergure. Treize femmes ont été évaluées dans le cadre de cette étude (huit dans le groupe EAU et cinq dans le groupe ML). Elles ont été identifiées à partir d'un groupe plus étendu comprenant 125 femmes qui avaient subi une ML et 200 femmes qui avaient subi une EAU au sein d'un établissement participant au moins 12 mois au préalable; de ces femmes, 32 de celles qui avaient subi une EAU et 27 de celles qui avaient subi une ML étaient en âge de procréer et admissibles à l'étude. Les participantes ont été soumises à une évaluation de leur réserve ovarienne (mesures des taux sériques d'HAM, d'estradiol et de FSH, et évaluation échographique de la NFA et du volume ovarien).

Résultats : Les taux sériques médians d'HAM étaient considérablement moins élevés chez les femmes qui avaient subi une EAU au moins 12 mois au préalable que chez les femmes

qui avaient subi une ML (0,78 ng/ml [plage : 0,67 - 1,28] vs 2,17 ng/ml [plage : 1,17 - 2,38], P = 0,01). La NFA médiane par ovaire était également considérablement moins élevée chez les femmes qui avaient subi une EAU que chez celles qui avaient subi une ML (3,5 [plage : 2 - 7] vs 7 [plage : 6 - 11], P = 0,03). Le volume ovarien et les taux médians de FSH et d'E_2 n'étaient pas considérablement différents d'un groupe à l'autre.

Conclusion : Les femmes en âge de procréer qui ont fait l'objet d'une EAU visant la prise en charge de leurs fibromes pourraient présenter, à long terme (> 12 mois), une réserve ovarienne moins élevée que celle des femmes ayant vu leurs fibromes être pris en charge au moyen d'une ML, ce qui pourrait exercer un effet indésirable sur la fertilité et/ou sur la réaction à de futurs traitements de procréation assistée. Cette constatation pourrait éclairer la décision quant au recours à un traitement à effraction minimale pour assurer la prise en charge des fibromes chez les femmes en âge de procréer qui souhaitent encore connaître une ou des grossesses. Elle laisse également entendre que la tenue d'autres études dans ce domaine s'avère justifiée avant que le recours à l'EAU ne soit élargi aux jeunes femmes en âge de procréer.

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INTRODUCTION

Uterine fibroids affect 50% to 80% of reproductive-aged women[1] and can lead to significant morbidity including menorrhagia, infertility, and mass-effect symptoms. In reproductive-aged women wishing to retain fertility, symptomatic fibroids have traditionally been excised through abdominal myomectomy. The abdominal incision required for this surgery, however, leads to a significant hospital stay and recovery period.[2] This has led to the development of less invasive alternatives. One such approach is laparoscopic myomectomy.[2] By avoiding a laparotomy incision, this approach allows for a short recovery period.[3] In addition to a shorter hospital stay and recovery period, decreased blood loss and decreased postoperative adhesions in comparison to abdominal myomectomy have been shown in case series.[4]

Uterine artery embolization is another less invasive approach for the treatment of uterine fibroids. It is a safe and effective treatment in which a catheter inserted through the common femoral artery is used to deliver particles to obstruct blood supply through the uterine artery, resulting in ischemia and regression of fibroids.[5,6] Although UAE is less invasive than surgical treatments and also results in a shorter recovery period,[7,8] it is generally only recommended in reproductive-aged women who do not want to preserve fertility.[7,9] However, numerous case studies have described pregnancies with reassuring outcomes occurring after UAE. This has led to increasing acceptance of performing UAE in reproductive-aged women, perhaps even in women for whom childbearing is not complete.[6,10,11]

When contemplating the best course of treatment for uterine fibroids in reproductive-aged women, it is important to consider the potential impact of each of the procedures on ovarian reserve, because ovarian dysfunction can lead to accelerated onset of menopause and diminished fertility. UAE may adversely affect the ovaries because of the anatomy of the pelvic blood vessels and the collateral blood supply of the uterus.[12] It is also possible that LM could affect ovarian function via inadvertent interruption of the ovarian blood supply or through direct ovarian injury. The term "ovarian reserve" refers to the number and quality of remaining oocytes in the ovaries and reflects remaining reproductive capacity. When ovarian reserve is decreased in reproductive-aged women, it can lead to a diminished response to ovarian stimulation with fertility treatments and potentially to decreased fecundity.[13] Ovarian reserve cannot be directly measured but can be estimated with hormone assays and ultrasound measurements. The most common traditional measures include assays of serum follicle stimulating hormone and estradiol-17β and ultrasound measurement of ovarian volume, performed on the third day of menstruation.[14–16] However, these measurements are often affected only in cases of severe compromise.[13,17] More sensitive measurements include day three antral follicle counts using transvaginal ultrasound and serum anti-Müllerian hormone levels, both of which are more closely correlated with ovarian follicle number and responsiveness to fertility treatment than the more traditional parameters.[13,17,18]

To begin to address the impact of various approaches to treatment for fibroids on ovarian reserve, we performed a retrospective cohort pilot study to compare the relative long-term effect on ovarian reserve of treating fibroids in reproductive-aged women with uterine artery embolization or with laparoscopic myomectomy. To our knowledge, this is the first study to compare these approaches directly using sensitive measures, including both AFC and AMH, to evaluate ovarian reserve following either procedure in women of reproductive age.

ABBREVIATIONS

AFC	antral follicle count
AMH	anti-Müllerian hormone
E_2	estradiol-17β
FSH	follicle stimulating hormone
LM	laparoscopic myomectomy
UAE	uterine artery embolization