UAE for the treatment of symptomatic adenomyosis

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Authors: V. D. Souftas, P. Tskouras, M. Mantatzis, E. Astrinakis, S. Foutzitzi, V. Liberis, P. Prassopoulos; Alexandroupolis/GR
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Purpose

Adenomyosis is a common disease with an incidence of 5-7% in surgical series, affecting primarily premenopausal women. It is characterized by the presence of heterotopic endometrial glands and stroma in the myometrium, associated with adjacent myometrial hyperplasia. Epithelial and stromal elements are situated at least 2.5mm beyond the endometrial-myometrial junction [1]. Adenomyosis may be either diffuse or focal (adenomyoma). Coexisting myomas and asymmetric wall involvement are common with the posterior uterine wall being mostly affected [2]. Menorrhagia and dysmenorrhea are the major symptoms of adenomyosis, occurring in approximately 60 and 25 percent of women, respectively [3]. Chronic pelvic pain may also occur.

On a clinical basis, adenomyosis may be suspected with the signs and symptoms taken into account, but distinction from myomatosis is impossible. Ultrasonography (US) and Magnetic Resonance Imaging (MRI) are imperative both for diagnosis and disease grading. Coexisting myomatosis may also be revealed [4,5].

Treatment of adenomyosis has been proven to be inefficient for the most part when a conservative approach is selected. Conservative treatment options include mainly hormone therapy, endometrial ablation, ligation of the uterine arteries and Magnetic Resonance Guided Focused Ultrasound Ablation (MRgFUS). Thus, even when a conservative approach is initially decided, most patients will ultimately undergo total hysterectomy for the definite treatment of adenomyosis [1].

Treatment options for adenomyosis alternative to surgical resection, including UAE, are currently under investigation. In particular, although initial control of symptoms is usually accomplished, the efficiency of a UAE as an alternative to hysterectomy on a mid-term and long-term basis is yet to be proven. Contraindications of UAE require further elucidation, though current data suggest it is not contraindicated. Jha RC et al have shown that symptoms regression is accomplished with UAE in cases of coexisting myomas and adenomyosis [6]. In their study, Kitamura Y et al achieved symptomatic control in most patients at 3 months and in many patients at 12 months post-treatment [7]. However, the study of Pelage JP et al has yielded less promising results on a long-term basis with only 55% of patients being asymptomatic at 24 months post-UAE [8]. Additionally, Dundr P et al have proven with histologic examination that remaining foci of adenomyosis still exist in the myometrium post UAE treatment [9].

The purpose of this ongoing study is to evaluate the mid-term results of uterine artery embolization (UAE) as a treatment option for symptomatic adenomyosis, alternative to hysterectomy.
Methods and Materials

The study comprises fifteen consecutive symptomatic women (age 37-55y.o., mean 46.3y) that were presented with dysmenorrhea, dyspareunia, pelvic discomfort, menorrhagia-metrorrhagia and anemia. Diffuse adenomyosis (n=5), focal adenomyosis (n=2), coexisting diffuse and focal adenomyosis (n=8) were diagnosed based on imaging findings (US, MRI) and clinical evaluation. Three patients had also myomatosis (Figure 1). Inclusion criteria were also based on the fact that all the patients desired to keep the uterus and were reluctant to a more invasive and amputating treatment such as hysterectomy (Figure 2). Patients at high risk for surgical treatment were also included in the study. All patients gave written informed consent, after being informed in detail about the procedure.

Prior to the intervention all patients were evaluated with gynecologic - clinical examination and laboratory tests, while the interventional radiologist retrospectively reviewed the imaging findings from the performed US and MRI examinations. The patients' history, pregnancy tests and blood tests were also reviewed. While in the interventional suite, a peripheral intravenous access line was secured and a catheter was placed in the urinary bladder. Chemoprophylaxis was initiated 1-3 hours before UAE (Augmentin iv 600mg, Metronidazole po 1g) and continued for 3-4 days.

Following unilateral puncture of the common femoral artery, superselective catheterization of the contralateral and ipsilateral uterine arteries was performed by 4-F catheters and 2.8-F microcatheters. Microspheres 500-900mm (n=5) and 700mm (n=10) were used as embolic agents. The embolization was peripheral and always bilateral, thus minimizing the risk of recurrence due to the presence of anastomotic vessels (Figure 3). Angiographic images were studied in detail in order to preserve the cervical and vaginal branches and also to appreciate anatomic variances such as atypical origin of the uterine arteries, origin of the ovarian and fallopian tube arteries from the uterine arteries, absence or aberrant origin of the uterine arteries. The procedures were terminated when the uterine arteries obtained the characteristic "pruned tree" configuration due to stasis on the main artery and non-opacification of the peripheral branches (Figure 4).

In order to reduce the radiation dose, image acquisition was performed using a low number of frames per second, while no magnification views were used during angiography. Magnification views were only used intermittently during fluoroscopy and fluoroscopic image acquisition, when considered imperative for the successful outcome of the procedure.

Follow-up imaging with MRI and clinical-laboratory assessment were performed at the 1st, 3rd, 6th and 12th month after embolization. Response criteria were defined as regression of clinical symptoms, restoration of menstruation, decrease on the uterine volume and partial or complete restoration of zonal anatomy. Patients will also be evaluated in 6-months intervals for the next 4 years.
**Fig. 0:** Study group comprising fifteen (n=15) women with diffuse adenomyosis (n=5), focal adenomyosis (n=2), coexisting diffuse and focal adenomyosis (n=8). Three patients had concurrent adenomyosis and myomatosis

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Fig. 0: Mid-sagittal T2-WI (2a,2c) and T1-WI fat-sat (2b,2d) post iv Gd chelate images of a patient with focal adenomyosis. Progression of the disease (2c,2d) 6 months after initiation of medical treatment (2a,2b). Significant worsening of clinical symptoms was also noted.

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**Fig. 0:** The catheterization and embolization should preferably be peripheral and always bilateral

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**Fig. 0:** Characteristic blushing in the area of focal adenomyosis is noted in 4a (pre-embolization). In 4b (post-embolization), the previously mentioned blushing has been eliminated. Note the stasis on the main artery and non-opacification of the peripheral branches
Results

Technically successful embolization of both uterine arteries was achieved in all cases. All patients suffered from severe post-procedural pain lasting 24h, which was treated with analgesics. No other immediate complication was noted.

A major complication occurred in one case (6%), 45 days post-embolization. This complication consisted of partial vaginal expulsion of necrosed portions of focal adenomyosis and sepsis. The necrosed tissues were surgically resected, while the uterus was preserved (Figure 1, Figure 2). On the follow up 6 months post-UAE, a significant decrease of the uterine volume and almost normal zonal anatomy were demonstrated.

On the third-month follow-up, regression of the clinical symptoms and normal menstruation was noted in 14/15 women (93%).

Mild menorrhagia was noted in a patient on the sixth-month follow-up.

MRI investigation disclosed partial or complete recovery of the normal uterine zone anatomy in all of the cases on the 6th-month follow-up. Decrease of the uterine volume was noted in 14/15 cases (93%) on the third and sixth month follow-up (Figure 3). In one woman with focal and diffuse adenomyosis, the third month follow-up MRI disclosed total degeneration of the posterior wall adenomyoma, while focal recurrence of the disease occurred in the background of previously existing diffuse adenomyosis in the anterior wall of the fundus (Figure 4).
Images for this section:

**Fig. 0:** Mid-sagittal T2-WI (1a) and T1-WI post iv Gd chelate (1b) sections demonstrating increased uterine volume as well as a large area of focal adenomyosis. In the mid-sagittal T1-WI post iv Gd chelate section (1c), one month post-UAE, note the dilatation of the uterine cavity, which contains necrotic tissue from the previously treated adenomyoma. The internal cervical os is also dilated.

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**Fig. 0:** Mid-sagittal T2-WI (2a) and T1-WI post iv Gd chelate (2b) sections 6-months post UAE, demonstrating significant decrease of the uterine volume and almost normal zonal anatomy (same patient as Figure 1)
**Fig. 0:** Mid-sagittal T2-WI sections prior (3a) and 6-months post UAE (3b), demonstrating significant decrease of the uterine volume and partial restoration of the zonal anatomy. The treated area of adenomyosis has low signal intensity indicating degeneration.

**Fig. 0:** Mid-sagittal T2-WI sections prior (4a) and 6-months post UAE (4b,4c), A case of coexisting focal and diffuse adenomyosis affecting the posterior and anterior fundus wall respectively (4a). Note the total degeneration of the posterior wall adenomyoma, as well as the focal recurrence of the disease in the background of the previously existing diffuse adenomyosis in the anterior wall of the fundus (4b,4c)
Conclusion

The short-term and mid-term results of our study are encouraging. Thus, UAE seems to be a technically efficient, non-amputating treatment option for adenomyosis, offering a significant regression of the patients’ symptoms. The procedure is well tolerated by using analgesics, while the risk of significant complications is low. Long-term results as well as the need for re-embolization are currently under evaluation.

Treatment of symptomatic adenomyosis with bilateral transcatheter embolization of the uterine arteries may offer an effective treatment option when conservative treatment fails.
References