Clinical aspects of uterine artery embolization

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SAFETY AND EFFECTIVENESS OF UTERINE ARTERY EMBOLIZATION IN PATIENTS WITH PEDUNCULATED FIBROIDS
Abstract

Purpose
Pedunculated subserosal fibroids are considered a relative contra-indication for uterine artery embolization (UAE). Decreased blood flow to the pedunculated fibroid may cause septic necrosis and separation from the uterus. The frequency of such complications is unknown. In this retrospective study we assessed complications and outcomes of UAE in women with pedunculated fibroids in a large single center patient cohort.

Materials and Methods
From a database with prospectively collected data of 716 women treated with UAE between 1996 and 2008, 29 women were identified with 31 pedunculated fibroids. MRI prior to embolization and at 3 months was used to calculate stalk diameter change and volume reduction of both pedunculated fibroid and uterus. Two observers assessed overall percentage infarction and infarction of pedunculated fibroid. Complications were recorded and long term clinical follow-up (mean 33 months, range 10-78) was assessed by questionnaire.

Results
Mean uterine and pedunculated fibroid volume reduction was 37% and 33%. Mean stalk diameter reduction was 0.3 cm (95% CI 0.18-0.52 cm) or 13% from initial mean diameter. Stalk enhancement was not affected by UAE.

Mean pedunculated fibroid infarction and mean overall infarction rate were for observer 1; 87% and 92% and for observer 2; 88% and 92% with good inter-observer variability. All women returned the questionnaire and no early or late complications of UAE were reported (0%, 95% CI 0.0-13.9%).

Conclusion
In this small series of pedunculated subserosal fibroids treated with UAE, no complications occurred. Our findings suggest that their treatment with UAE may be safe and effective.
Introduction

Uterine artery embolization (UAE) is increasingly offered as a safe and effective alternative to myomectomy or hysterectomy for symptomatic uterine fibroids (1-9). The presence of pedunculated fibroids is considered a relative contra-indication for UAE (10-12). If a pedunculated fibroid becomes septic after embolization, a hysterectomy is needed: involvement of the bowel due to infection or formation of adhesions may necessitate concomitant partial bowel resection. However, the frequency of such serious complications is unknown. Recent studies of small patient groups indicated that UAE for pedunculated fibroids may be safer than previously thought (13-14). The objective of our study was to retrospectively assess the complications and outcomes of UAE as a treatment for patients with pedunculated fibroids selected from a large single center cohort.

Materials and Methods

Patients
This retrospective study was approved by the Institutional Review Board with a waiver for informed consent. From an institutional database with prospectively collected data of 716 women with symptomatic uterine fibroids treated with UAE between 1996 and 2008, 29 women were identified with 31 pedunculated fibroids, defined as a stalked subserosal fibroid with a stalk diameter of less than half of the fibroid diameter (15). All 29 women were premenopausal with a mean age of 44 years (median 44, range 34-51 years).

Embolization technique
UAE was performed after selective catheterization of the left uterine artery and guiding the catheter into the right uterine artery by means of the Waltman loop manoeuvre. Bilateral embolization via an unilateral approach was performed in all women. The use of a microcatheter was left to the discretion of the physician. In women who desired future pregnancy, embolization was performed on two sides at the same time to limit radiation exposure to the ovaries. Various embolic agents with size of 500–900 microns
were used. The angiographic embolization endpoint was a complete occlusion of branches to the perifibroid plexus, with sluggish flow in the ascending segment of the uterine artery, and leaving the main uterine artery, cervicovaginal branches, and utero-ovarian anastomoses patent.

**Imaging**

All patients had native and contrast enhanced MRI prior to embolization and at 3 months post embolization. From baseline MRI, the diameter of the pedunculated fibroid stalk and the dimensions of the pedunculated fibroid and the uterus were assessed. The diameter change of the stalk and the rates of pedunculated fibroid and uterine volume reduction were assessed by comparison 3 months MRI with baseline. Volume calculation was done by using the formula of a prolate ellipse (length x depth x width x 0.5233). Pedunculated fibroid infarction rate and overall infarction rate (including the pedunculated and all other present fibroids) were assessed by two observers independently on 3 months MRI by visual estimation of decrease in enhancement as compared to baseline MRI. Infarction rates were subsequently classified as 100%, 90-99%, 80-90% and less than 80% (16).

**Outcome and follow-up**

Complications were assessed according to the classification by Goodwin (15) using information collected at the time of the hospital stay or an unanticipated hospital visit, and on an interview and questionnaire at the time of 3 months follow-up MRI. Symptomatic outcome and patient satisfaction were assessed with serial questionnaires as part of the routine follow-up assessment.

In October 2008, at mean 33 months after UAE (range 10-78 months), all 29 women with pedunculated fibroids received a questionnaire about general well being, satisfaction of treatment, residual complaints, additional treatment for the same disorder and the occurrence of late complications needing doctor’s attention or hospital admission.
Data analysis
Complications were calculated as a percentage with 95% CI. Mean volume reduction as a percentage of initial volume of pedunculated fibroid and uterus was assessed. Mean pedunculated fibroid stalk diameter reduction and mean decrease in contrast enhancement was expressed as a percentage. T-test was used for comparison of means. P-values <0.05 were considered significant. Interobserver variability of overall and pedunculated fibroid infarction rates was assessed with κ-statistics. Statistical analysis was performed with MedCalc 10 statistical software (MedCalc, Mariakerke, Belgium).
Results

Mean diameter of the pedunculated fibroid was 7.45 cm (median 7, range 4.5-12.3 cm). Frequency distribution of fibroid size is displayed in Fig. 1.

Mean pedunculated fibroid volume before UAE was 168 cm³ (median 99, range 26-502 cm³) and at 3 months this was 113 cm³ (median 53, range 15-373 cm³). Mean volume reduction of the pedunculated fibroid was 55 cm³ (95% CI 28-82 cm³) or 33% from initial mean volume.

Mean pedunculated fibroid stalk diameter before UAE was 2.6 cm (median 2.5, range 1.6-5.2 cm) and at 3 months this was 2.3 cm (median 2.3, range 1.4-4.1 cm). Mean diameter reduction of the pedunculated fibroid stalk was 0.3 cm (95% CI 0.18-0.52 cm) or 13% from initial mean diameter. All 31 stalks enhanced before UAE and at 3 months 28 stalks still enhanced, in the remaining 3 cases this could not be evaluated (Fig. 2).

Mean uterus volume before UAE was 600 cm³ (median 510, range 47-1808 cm³) and at 3 months this was 377 cm³ (median 352, range 46-1131 cm³). Mean volume reduction of the uterus was 223 cm³ (95% CI 127-317 cm³) or 37% from initial mean volume.

Figure 1. Frequency distribution of maximum diameter in the 31 pedunculated fibroids.
Mean overall infarction rate for observer 1 was 92% and for the pedunculated fibroid only this was 88%. For observer 2 these figures were 92% and 87%. Inter-observer variability for overall infarction rate was good (κ=0.745) and for pedunculated fibroid infarction rate this was also good (κ=0.753).

All 29 patients responded to the late follow-up questionnaire. There were no early or late complications of UAE (0%, 95% CI 0.0-13.1%). Four patients had a hysterectomy at various intervals after UAE due to persistent complaints with persisting enhancing fibroids. In 3 of these patients the pedunculated fibroid was not dominant and was completely infarcted. In these 3 patients there were no adhesions found at surgery. In one patient who underwent hysterectomy the presumed pedunculated fibroid showed persistent enhancement. However, on pathological examination this revealed to be a leiomyosarcoma. In this patient, extensive adhesions were present during surgery. The remaining 25 women reported improvement or cure of presenting symptoms with a high degree of treatment satisfaction.

**Figure 2.** Contrast enhanced T1 weighted MRI before (A) and 3 months after (B) uterine artery embolization in a 43-year old woman. While the pedunculated fibroid is completely infarcted, vascularization of the stalk is intact (arrow).
Discussion

We found that embolization of symptomatic patients with pedunculated fibroids was safe and effective; after a mean follow-up period of 33 months, no early or late complications had occurred. Although 4 patients needed hysterectomy during the follow-up period, the indication for this additional therapy was not related to the presence of the pedunculated fibroid.

The general conception that pedunculated fibroids are a relative contra-indication for UAE is based on 3 cases as part of 3 early series (12-14). In 2 of these 3 cases, septic necrosis of pedunculated fibroids necessitated emergent hysterectomy. In one woman the septic pedunculated fibroid was closely related to the bowel, and partial bowel resection had to be performed. The third case reported a liquefied change of a pedunculated fibroid leading to an increased size. It must be noted that these early reports did not provide detailed information on important clinical and imaging parameters such as the diameter of the stalk and the size of the pedunculated fibroid before and after embolization. Moreover, the relative frequency of these complications was not accounted for.

Although never documented, there is a general fear that necrosis of the stalk of the pedunculated fibroid may lead to separation of the pedunculated fibroid from the uterus into the abdominal cavity. To clarify this postulation we evaluated the change in vascularization of the stalk by comparing pre and post embolization contrast enhanced MRI's. Remarkably, the enhancement and thus vascularization of the stalk remained unaffected by the embolization in all patients where it could be evaluated, while devascularization and volume reduction of the pedunculated fibroid was significant and in the same magnitude as for the intramural fibroids. Probably, the arterial supply to the stalk is by uterine stroma arteries and not by uterine artery branches to the perifibroid plexus. Following our embolization protocol we did not encounter any over-embolization which might lead to stalk devascularization and infarction. With proper embolization technique, the fear of separation of pedunculated fibroids from the uterus after embolization seems at least premature.
Our finding that embolization of pedunculated fibroids is safe and effective is in concordance with two recent smaller studies with 12 and 16 patients with pedunculated fibroids who underwent UAE (13-14). In both studies, pedunculated fibroid infarction was effective and no complications occurred. Also in these studies, stalk vascularization was not affected by the embolization in all patients were it could be evaluated. A limitation of our study is the limited patient group. However, pedunculated fibroids are rare in the population with symptomatic fibroids that are treated with UAE, in our series just over 4% (29 of 716). A strong point of our study is that patients were well documented with complete and long-term clinical follow-up.

The available data thus far indicate that serious complications of UAE in pedunculated fibroids are probably rare. There is no reason to believe that complication rate of UAE in patients with pedunculated fibroids is higher than in patients with intramural fibroids. Perhaps, the subserosal location of the fibroids may predispose for the formation of intra-abdominal adhesions, but this has not yet been elucidated (17). Although these data are derived from a small number of patients, they suggest that patients with symptomatic fibroids in the presence of a pedunculated subserosal fibroid may still be treated safely with UAE.
References


