Risk of Intrauterine Infectious Complications after Uterine Artery Embolization

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PURPOSE: To identify risk factors for the development of intrauterine infection following uterine artery embolization.

MATERIALS AND METHODS: A retrospective review of uterine artery embolizations (UAE) performed for the treatment of symptomatic fibroids from January 2000 to July 2003 was conducted. With logistic regression and the Fisher exact test, multiple variables were analyzed as predictors for intrauterine infectious complications requiring medical and/or surgical therapy, including the use of preprocedural antibiotics, embolic agent used, quantity of embolic material, location of fibroids (submucosal, nonsubmucosal), and size and location of the dominant fibroid.

RESULTS: A total of 414 UAE procedures were performed in 410 patients with a technical success rate of 99%. Average age of the patient cohort was 42.8 years (SD, 5.8 years). One hundred forty-eight patients (36.1%) had submucosal fibroids or fibroids projecting submucosally, 262 patients (63.9%) had nonsubmucosal fibroids. Intrauterine infectious complications requiring intravenous antibiotic therapy and/or surgery occurred in five patients (1.2%). A total of five infectious complications requiring therapy occurred in the submucosal group (3.4%) and none in the nonsubmucosal group. Patients within the submucosal group were more likely to develop intrauterine infectious complications than patients with nonsubmucosal fibroids based on univariate analysis ($P = .006$) but with logistic regression, the association was not significant ($P = .079$). No significant difference with embolic agent, quantity of embolic particles, use of preprocedure antibiotics, or size of or location of the dominant fibroid was found.

CONCLUSION: No specific risk factor for intrauterine infection following UAE was identified in this study. Infection after UAE is rare and appears to be a sporadic occurrence. Nevertheless, close surveillance is warranted in all women following UAE given the potential morbidity of this complication.

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Abbreviations: PES = postembolization syndrome, UAE = uterine artery embolization

TRANSCATHETER embolization of the uterine arteries for treatment of symptomatic leiomyomata was first reported by Ravina et al in 1995 (1). By the year 2000, it has been estimated that more than 10,000 procedures were performed worldwide, based on survey data obtained by the Society of Interventional Radiology (2). This number continues to increase as the technique becomes more widely accepted and adopted into standard practice patterns. Multiple large prospective and retrospective studies have demonstrated the efficacy and safety of this procedure with short- and mid-term clinical success in approximately 85% of patients with minimal morbidity and mortality (3–8).

Despite the now widespread dissemination of uterine artery embolization (UAE) as an alternative to hysterectomy, specific risk factors for development of postprocedural intrauterine infection have not been clearly defined. Some investigators have suggested that location of fibroids, particularly submucosal fibroids, may be associated with an increased risk of infection (6,9). After encountering several episodes of infectious intrauterine complications, we retrospectively examined our patient population to determine if location of fibroids predisposed a patient to increased risk of infection. We also examined whether use of preprocedure antibiotics, type of embolic agent, and size and location of the dominant fibroid was associated with an increased risk of intrauterine infectious complications. Clinical outcome following UAE for symptoms related to leiomyomata is not the focus of this study and was therefore not assessed.

MATERIALS AND METHODS

Patient Group

A retrospective analysis was performed on the records of all patients

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who underwent UAE at two different institutions for symptomatic fibroids (including abnormal uterine bleeding and bulk symptoms) between January 2000 and July 2003. A total of 410 patients were embolized for symptomatic fibroids. Average age of the patient cohort was 42.8 years (SD, 5.8 years) with 66% of patients of white race, 11% of Asian race and 23% of Afro-Caribbean race. All patients were referred by gynecologists and underwent a gynecological examination (performed by gynecologists) before UAE to rule out other causes for their symptoms. Exclusion criteria included: pregnancy, gynecologic malignancy or premalignancy, adenomyosis with no associated fibroids, severe renal insufficiency, acute vasculitis, any acute or chronic infection, active pelvic infection or history of pelvic inflammatory disease, and uncorrectable coagulopathy. The procedure, risks, indications, and alternatives were explained to the patient in detail by the treating interventional radiologist, after which informed consent was obtained from all patients. Preadmission blood work was performed approximately 1 week before treatment. Investigations included prothrombin time and international normalized ratio, partial thromboplastin time, complete blood count with platelet count, and serum creatinine. Transvaginal ultrasound (US) examinations were performed before embolization to document baseline characteristics of the uterus and fibroid(s) in all cases. If transvaginal US findings were suggestive of adenomyosis or other pelvic pathology, magnetic resonance (MR) imaging of the pelvis was performed. The size of the dominant fibroid was the mean diameter of the largest fibroid. Follow-up for each patient was obtained through health records maintained by the treating interventional radiologists, telephone correspondence with referring physicians and, in some cases, directly with the patient. Clinical follow-up and pelvic US examinations were performed at 3, 6, and 12 months following UAE and on a pro re nata basis based on patient concerns and symptomatology. No patients were lost to follow-up within 30 days of the UAE procedure. Institutional review board approval was obtained for this retrospective study.

Embolization Technique

Antibiotic coverage, when administered, involved intravenous administration of 1 g of cefazolin (Ancef; SmithKline Beecham Pharm, Oakville, Ontario, Canada) 1 hour before the procedure. Patients who were allergic to penicillin were administered 500 mg vancomycin intravenously (Vancocin; Eli Lilly Canada, Scarborough, Ontario, Canada). Antibiotic coverage was provided at the discretion of the treating radiologist. All patients had Foley catheters placed by nurses before treatment.

Embolization therapy was provided by five interventional radiologists; all were fellowship-trained in vascular and interventional radiology and had at least 3 years of experience in peripheral angiography and embolization techniques (range, 3–25 years). Patients were monitored with pulse oximetry, blood pressure, and electrocardiography. Intravenous fentanyl citrate (Abbott Laboratories, Abbott Park, IL) and midazolam (Versed; Roche Laboratories, Nutley, NJ) were used to provide conscious sedation and analgesia. Embolization was performed through a unilateral common femoral artery access approach in all patients with the Seldinger technique. An initial pelvic arteriogram was obtained to outline pelvic arterial anatomy. Selective arteriography and embolizations were performed with standard 4- to 5-F catheters and microcatheters. Microcatheters were used when standard angiographic catheters could not be advanced into the distal uterine artery or branches of the uterine artery because of vessel size, tortuosity, and/or spasm.

The primary embolic agent was polyvinyl alcohol (PVA) particles 300 to 500 μm in size and packaged as 1 mL per vial (Contour; Target Therapeutics, Boston Scientific Corporation, Mississauga, Ontario, Canada or Ivalon; Cook, Stouffville, Ontario, Canada). An emulsion was made of embolic material hand mixed in a syringe with saline and nonionic contrast material in a ratio dependent on contrast agent density. Embolization proceeded until a standing column of contrast material in the uterine artery was observed or contrast material refluxed toward the uterine artery origin. Trisacryl gelatin microspheres (Embospheres; Biosphere Medical, Rockland, MA) 500–700 μm in size were also used. Embospheres were hand-mixed in a syringe with nonionic contrast material. The endpoint of embolization with Embospheres was when no residual hypervascularity related to the fibroids was angiographically visible, stasis was observed in the distal part of the uterine artery, or there was reduced flow in the proximal part of the uterine artery. After embolization, the sheath and catheter were removed and hemostasis at the puncture site was obtained by direct manual compression. The basis of embolic agent selection depended upon operator preference.

All UAEs were performed as overnight procedures with patients admitted the day of the procedure and all patients remained in hospital for a minimum of 24 hours for observation and pain control if necessary. After UAE, morphine sulfate was administered through a patient-controlled analgesic pump. Nausea was managed by metoclopramide (Reglan; Wyeth-Ayerst, St. Laurent, Quebec, Canada), or dimenhydrinate (Gravol; Carter Horner, Mississauga, Ontario, Canada). Foley catheters were removed 4 to 8 hours after the procedure. Patients were discharged the following morning if ambulatory and tolerating oral intake. After discharge, pain was controlled with use of oral nonsteroidal anti-inflammatory and narcotic analgesic drugs. No intravenous or oral antibiotics were routinely administered following preprocedure intravenous antibiotic administration.

Study Endpoints and Definitions

Technical success was defined as occlusion or marked reduction in blood flow in both uterine arteries. Successful embolization of only one uterine artery was considered a technical failure unless only a single uterine artery is present. Patients were grouped according to the location of fibroids visualized with transvaginal US examination. Patients examined with transvaginal US were considered to have submucosal fibroids if there was disruption or distortion of the endometrial lining of the uterus with variable projection into the endometrial cavity (10–12). If the patients had multiple fibroids in different locations

with at least one fibroid identified in a submucosal location, they were classified in the submucosal group. If there was no ultrasound evidence of submucosal fibroids, patients were categorized as nonsubmucosal.

Endometritis was defined as infectious inflammation of the inner lining of the uterus (endometrium) after UAE, which manifested as pelvic pain, watery vaginal discharge, fever, and/or leukocytosis (13). Uterine (myometrial) infection was defined as infection of the uterus, manifesting as abdominal or pelvic pain, vaginal discharge, fever, and/or leukocytosis (13). Intrauterine infection was defined as uterine infection, endometritis, or a combination of both. In addition, all patients who were suspected to have an intrauterine infection underwent clinical assessment by a board certified gynecologist who, based on clinical, laboratory and/or imaging findings, established the clinical diagnosis. Postembolization syndrome (PES) was defined as the occurrence of pelvic pain, low-grade fever, nausea, vomiting, loss of appetite, and malaise within the first few days after undergoing UAE (13). Distinction of PES from intrauterine infection was determined based on one or more of the following: the presence or absence of foul smelling vaginal discharge (not present in PES), clinical time course of the presenting symptoms (PES occurs within a few days of UAE), presence or absence of a high grade leukocytosis (not present in PES) and clinical improvement of the patient with therapy. These complications were considered procedure-related if they occurred within 30 days of UAE (14). Complications were classified according to criteria established by the Standards of Practice Committee for the Society of Cardiovascular and Interventional Radiology (15). Minor complications included events that involved nominal therapy of no consequence such as groin hematomas that resolved spontaneously. Major complications included events that involved minor therapy with a short hospitalization, major therapy with an unplanned increase in care and prolonged hospitalization ($>$ 48 hours), or permanent adverse sequelae or death. Infective complications were assessed within 30 days post UAE by chart, telephone, laboratory, and imaging review. Information collected included use of preprocedural antibiotics, embolization material used, dominant fibroid size, and location of the dominant fibroid.

Statistical Analysis

Predictors of developing intrauterine infection following UAE were examined using Fisher exact test. Predictors analyzed included submucosal versus nonsubmucosal location, location of dominant fibroid, size of dominant fibroid, type of embolic particle used (PVA vs Embospheres), quantity of embolic agent (recorded to 0.25 vial increments), and use of antibiotic prophylaxis. Predictors found to be associated with developing intrauterine infection were subsequently combined into a multivariate model and examined using logistic regression. Software systems used for statistical analysis were SAS version 8.02 (SAS Institute Incorporated, Cary, NC) and Stata 6.0 (Stata Corporation, College Station, TX). A P value of .05 was considered the threshold of statistical significance.

RESULTS

A total of 414 UAE procedures were performed on 410 patients with a technical success rate of 99%. Four technical failures occurred. One technical failure was caused by a lack of definitive uterine arteries with dominant flow to the uterus via the ovarian arteries. In the second failure, one uterine artery was not embolized because of large collaterals visualized angiographically to the ovary. A clinical decision to not embolize was made. Two failures were attributed to unsuccessful selective catheterization of the left uterine artery because of tortuous anatomy.

In 103 embolizations, patients did not receive preprocedure antibiotics whereas 311 embolization procedures were performed after administration of antibiotics. Cefazolin 1 g intravenously was administered in 306 embolization procedures and vancomycin 1 g intravenously in five procedures. Embospheres were used in 48 (11.6%) embolization procedures, PVA was used in 364 (87.9%) cases; and a combination of both was used in two cases (0.5%). The quantity of embolic agent ranged from 0.75 to 20 vials per patient; a median of 3 vials and a mean of 3.3 vials were used. A slightly larger number of vials of embolic agent were required in patients embolized with Embospheres than with PVA (mean, 4.4 vials vs 3.2 vials); however, this difference was not statistically significant ($P = .06$, unpaired Student t test). The mean dominant fibroid size was 7.7 cm (SD $\pm$ 3.2 cm) within the patient population.

One hundred forty-eight patients (36.1%) had submucosal fibroids or fibroids projecting submucosally, 262 patients (63.9%) had nonsubmucosal fibroids based on transvaginal US examination. Twenty-four patients had a surgical history of myomectomy and five patients had hysteroscopic fibroid removal before UAE. The remaining 408 patients had no major gynecologic surgical history. Intrauterine infectious complications requiring intravenous antibiotic therapy and/or surgery occurred in five patients (1.2%). A total of five infectious complications requiring therapy occurred in the submucosal group (3.4%) and none in the nonsubmucosal group. Four of the five patients that developed intrauterine infective complications had fibroids in multiple locations including submucosal fibroids with one patient only having a single submucosal fibroid. Two of the five patients had the dominant fibroid located in the submucosal position whereas the remaining three patients had nonsubmucosal dominant fibroids. Four of the five patients received preprocedural antibiotics and all five patients were embolized with PVA particles. Dominant fibroid size in patients that developed intrauterine infectious complications was 7.2 cm (SD $\pm$ 2.3 cm) compared with 7.7 cm (SD $\pm$ 3.2 cm) in patients that did not ($P = .77$).

None of the five patients had a history of pelvic inflammatory disease, sexually transmitted diseases or diabetes mellitus. One patient was admitted 3 weeks after UAE with severe pelvic pain, foul smelling discharge from the vagina, and leukocytosis (WBC 13.9×10^9 cells per liter). US examination completed on the day of admission was consistent with endometritis (**Figure**). One week prior to admission she was started on oral antibiotics for foul smelling vaginal discharge. A vaginal swab culture demonstrated normal vaginal flora. After 48 hours of intra-

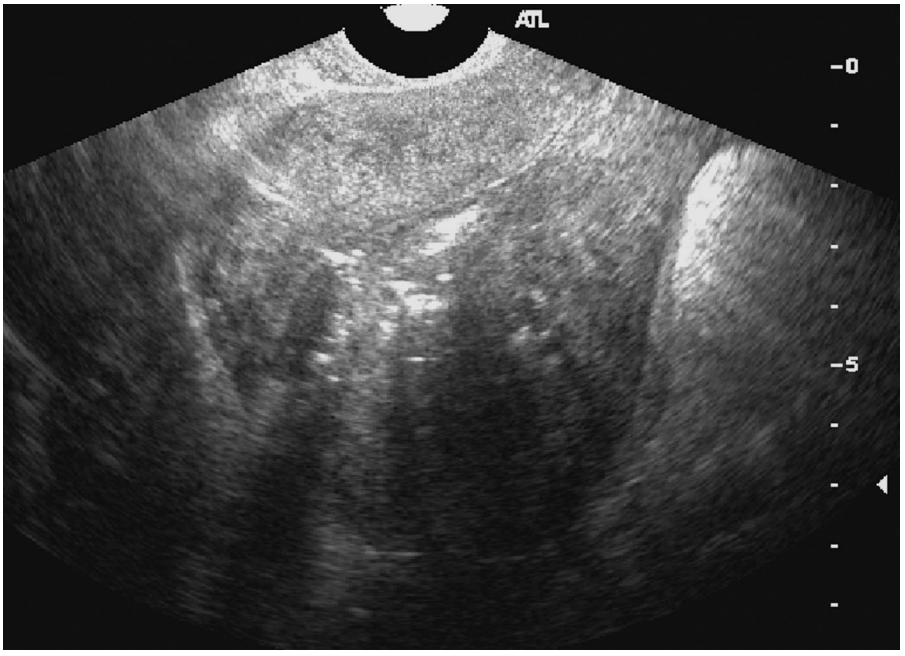

Figure. Two weeks following embolization, a 37-year-old patient presented to the emergency room with pelvic pain, foul smelling vaginal discharge, and fever. Transvaginal US (sagittal view) demonstrated a thickened endometrium, with fluid and air in the endometrial cavity consistent with endometritis.

venous antibiotics, the pelvic pain, vaginal discharge, and leukocytosis resolved and she was discharged with oral antibiotics. Another patient presented 11 days following UAE with lower abdominal cramping and fever for 3 days. Her temperature on admission was 39.3°C. On vaginal examination, bloody purulent fluid was visualized. Her white blood cell count was normal and vaginal swab cultures were negative. After 48 hours of antibiotics, her fever and pain resolved. The third patient presented 14 days after UAE with fever, chills, and vaginal discharge. Her white blood cell count was 14.3×10^9 cells per liter on admission with a temperature of 38.0°C. US examination was consistent with endometritis. Blood cultures and a vaginal swab were negative for growth. The patient responded to 24 hours of antibiotics and was discharged home without further intervention. The fourth patient presented 14 days after UAE with fever, chills, severe pelvic pain, and foul smelling vaginal discharge. Her white blood cell count on admission was 10.4×10^9 cells per liter. The patient was unable to tolerate a speculum examination preventing cultures from being performed. After 48 hours of intravenous antibiotics, the patient was discharged. Following antibiotic treatment, none of these four patients had vaginal passage of fibroid tissue. The fifth patient was admitted 25 days following UAE with fever, pelvic tenderness, foul smelling vaginal discharge, and an elevated white blood cell count of 21×10^9 cells per liter. Hysteroscopy demonstrated a degenerating submucosal fibroid with pus in the endometrial cavity. During attempted hysteroscopic removal of the fibroid, the uterus was perforated requiring subsequent hysterectomy.

There was a significant difference in occurrence of intrauterine infectious complications in the patients with submucosal versus nonsubmucosal fibroids ($P = .006$) with univariate analysis. However, this association was not significant with multivariate analysis ($P = .079$). No significant difference with embolic agent ($P = .71$), quantity of embolic agent ($P = .33$), size of the dominant fibroid ($P = .74$), location of the dominant fibroid ($P = 1.0$), or use of prophylactic preprocedure antibiotics ($P = .81$) was observed (**Table**).

Total complication rate in this patient cohort was 6.1% (25 patients). Eleven major complications (2.7%) occurred including the five infectious complications described above. The sixth patient developed a common femoral artery pseudoaneurysm with concurrent femoral deep venous thrombosis and pulmonary embolism. The pseudoaneurysm was treated with thrombin injection and the patient was subsequently orally anticoagulated. The seventh major complication was formation of a deep venous thrombosis with pulmonary embolism. This patient was also treated with anticoagulation. Four patients were readmitted for pain management. Fourteen minor complications (3.4%) occurred. Five patients developed urinary tract infections treated with oral antibiotics. Nine patients were assessed in an outpatient setting for vaginal passage of fibroid tissue (seven patients had submucosal fibroids, two patients had intramural fibroids) and no further medical or surgical intervention associated with passage of the fibroid tissue was required.

DISCUSSION

Active (untreated) infection is a contraindication to embolization of any organ, because of the risk of abscess formation and related septic complications. Relative contraindications to pelvic embolization include immunocompromised states, prior pelvic irradiation or surgery, and chronic endometritis or a partially treated pelvic infection. All of these conditions predispose the woman at a higher risk of an infectious complication. Although major complications can occur during or as a result of UAE, they are rare (16). Suspicion of infection has prompted hysterectomy on occasion (17,18), but until now, no imaging findings that predict possible infectious intrauterine complications have been described.

In this study, all patients selected for UAE underwent transvaginal US examination prior to embolization. Attention was directed to the location of fibroids. Submucosal fibroids were described as those that caused distortion or obliteration of the endometrium. This included intramural fibroids with a submucosal component that also caused distortion or obliteration of the

Predictors Analyzed for Risk of Intrauterine Infection Following UAE

Variable	Odds Ratio	95% Confidence Interval	*P* Value
Submucosal vs. nonsubmucosal fibroids	0.11	0.01–1.29	.079†
Use of preprocedure antibiotics Yes vs. No	1.31	0.14–11.9	.81†
Type of embolic agent PVA vs. Embospheres	–	–	.71*
Vials of embolic particle used	1.12	0.89–1.42	.33†
Size of dominant fibroid	0.95	0.71–1.27	.74†
Location of dominant fibroid	–	–	1.0*

* Fisher exact test.
† Logistic regression.

endometrium. In a recent study, the authors suggested that it is the size of fibroids that predisposes a patient to infection (19). Because we hypothesized that the mere presence of submucosal fibroids was the major predisposing factor, we stratified patients based on their location into submucosal and nonsubmucosal groups, not on the location of the dominant fibroid. This was verified by our findings that location of the dominant fibroid had no statistically significant association with the development of infectious intrauterine complications. We also stratified patients based on use of preprocedure antibiotics and the type of embolic agent used to assess if they had any impact on the development of endometritis. We found the risk of developing intrauterine infectious complications was not significantly increased with submucosal fibroids despite observations made in the examined patient cohort.

Infectious intrauterine complications are rare following UAE with multiple isolated reports; many of these patients proceeded to hysterectomy (20). There have also been two reports of deaths within 30 days of UAE attributed to uterine infection and overwhelming sepsis (21,22). Review of these studies indicates that almost all reported cases of infectious complications have occurred in patients with submucosal fibroids. In an early report by Goodwin et al (17,23), 11 patients underwent UAE, with one patient developing endometritis and pyometra 3 weeks after the procedure necessitating hysterectomy. She received preprocedure antibiotics. Preprocedure US imaging in this patient demonstrated multiple fibroids with a dominant submucosal fibroid. In another report, fatal septicemia occurred 10 days following UAE in a patient who had a large submucosal fibroid demonstrated with hysteroscopy and MR imaging (21). A single case report of uterine infection and sepsis 12 days after embolization has also been reported. This patient also had a dominant submucosal fibroid (24). This report is not part of a patient series and therefore the incidence of this complication is indeterminate. In a treated patient population of 80, Pelage at al (9) also had one patient develop infectious endometritis with septic uterine necrosis requiring hysterectomy. This patient was found to have a large submucosal fibroid. Based on these reports, some have suggested that submucosal fibroids are an independent risk factor for complications occurring with UAE.

In a recent study, leiomyoma size less than or greater than 10 cm in diameter was examined. Major complications were observed in 6.4% of patients with fibroids greater than 10 cm and 1.9% when fibroids were less than 10 cm (19). Although no statistical difference in major complications occurred between the two groups, four of the five patients who experienced major complications had submucosal fibroids of whom two patients (1.3%) developed intrauterine infections (19). In another study of 163 embolizations, one patient with a submucosal fibroid underwent hysterectomy for uterine abscess formation with no other intrauterine infections occurring (4). The number of patients with submucosal fibroids was not quantified in this study. In another study, four out of 42 patients were readmitted with signs and symptoms of infection where vaginal swab cultures grew organisms. The patients in this study had been admitted for 3 days prior to UAE and had received intravenous antibiotics with gram positive and negative coverage prior to and following the procedure for the duration of their admission. Location of fibroids was not assessed and the relatively high proved infection rate (10%) is not consistent with findings in larger completed series (25). In a larger series, two patients (0.5%) underwent hysterectomy for intrauterine infections. No clear description of fibroid location was provided (6). In another published series where 555 patients were treated, two patients underwent hysterectomy for suspected intrauterine infections despite preprocedure antibiotics (18). In a study that specifically addressed complications following UAE, in 400 embolizations, four cases of endometritis occurred that were successfully treated with dilatation and curettage, and intravenous antibiotics. Two of these infections were associated with leiomyoma passage (20).

Many of these studies have patient study sizes that were too small to detect significant risk. Studies large enough to examine this potential risk factor for predisposition of developing intrauterine infective complications did not do so. This can be attributed to failure to identify the location of fibroids within the uterus and inconsistent preprocedure imaging and follow-up. In our study, all patients underwent transvaginal ultrasound examination prior to embolization.

We did not find that use of either PVA or Embospheres were predictive for the development of endometritis. Despite all infections occurring in patients that were embolized with PVA particles, the comparative sample size is too small to make a definitive conclusion. There are two cases of intrauterine infection following use of Embospheres. In a single case report by Fogt et al (26) a patient who underwent UAE for menorrhagia with Embospheres presented with intractable pelvic pain 2 months later. A hysterectomy was performed which demonstrated large amounts of pus in the

endometrial cavity. It is unclear from the report where the fibroids were located and if the use of Embospheres contributed to the infection (26). In another report, fatal sepsis occurred following embolization of an intramural fibroid with Embospheres (22). The report briefly mentions the bowel system and uterus appearing necrotic with pus in the abdomen. No clear conclusion can be made regarding risk of infection compared to embolic agent and location of the fibroid. Despite these reports, no major infectious complications occurred with the use of Embospheres in a study by Spies et al (27). The sample size was 30 patients compared with our 48 patients in which we also did not have any infectious complications.

Although no study has proved the value of prophylactic antibiotics in UAE, prophylactic antibiotics may reduce the incidence of sepsis after embolization and infarction of solid abdominal organs (28). In one study, two infections occurred despite prophylactic antibiotics being administered prior to and for 5 days following UAE in 200 patients (29). Fatal sepsis has been reported in one patient despite use of prophylactic antibiotics (21). PES occurs commonly after embolotherapy; approximately 40% of women develop fever during the first week after UAE (3,23). This is often accompanied by pain and leukocytosis. It is important to distinguish this component of PES from acute infection. We did not find any significant difference in risk for infectious complications with or without the use of preprocedural antibiotics. In addition, we observed a low rate of infectious uterine complications (1.2%) without the routine use of postprocedural antibiotics. Cervical culture may have a role in also detecting patients predisposed to endometritis although this has not been validated.

The clinical manifestations of PES can mimic those of infectious endometritis. However, within this study, all five patients presented at least 11 days following embolization when most cases of uncomplicated PES should have resolved. This observational finding suggests that patients that develop or continue to have symptoms consistent with PES with foul smelling vaginal discharge beyond 1 week of UAE should be evaluated for intrauterine infection.

Although this study does not demonstrate a higher risk of intrauterine infection when a patient has fibroids extending submucosally or submucosal fibroids, the data and the historical outcomes presented above suggest a trend that intrauterine infections are associated with fibroids in a submucosal position. At our institution, we now advise patients with submucosal fibroids or fibroids with submucosal extension that there may be a higher risk of infectious complications. If following embolization, there is concern that a patient has developed an intrauterine infection, we reimage the patient with transvaginal US and arrange for the patient to be clinically evaluated by a gynecologist within 24 hours or sent to an emergency room for more immediate evaluation if thought to be necessary.

There are several limitations of this study. The outcomes in this study are retrospective and specific to the population studied. The population size is relatively small given that the frequency of major infective complications is rare. Another limitation is variability in the use of descriptors of position of fibroids. A standardized definition of what constitutes a submucosal fibroid on transvaginal US has been described and this modality has been found to be an accurate tool (10,30). Despite this, there is increasing evidence validating the effectiveness and in some cases, the superiority of MR imaging in evaluating the location of fibroids, in detecting pelvic pathology responsible for symptoms other than fibroids and in post UAE evaluation (31–33). Increasing use of pre and post UAE imaging with MR imaging may allow for a more detailed evaluation of outcomes and complications in the future.

In summary, our observed low rate of infectious complications (1.2%) among women undergoing UAE highlights the safety of this procedure. Only one patient requiring hysterectomy for an infectious complication, and this was the result of perforation of the uterus during dilation and curettage. Of the variables we examined, none were found to be predictive of developing intrauterine infectious complications. Nevertheless, close surveillance is warranted in all women following UAE given the morbidity of this complication.

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