UTERINE ARTERY EMBOLIZATION: DIFFERENT INDICATIONS AND OUTCOME
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ABSTRACT

BACKGROUND
Uterine Artery Embolization is an Interventional Radiology technique involving placement of a catheter and injection of an embolizing agent in the uterine artery. It has now become an accepted option for the treatment of symptomatic fibroids and other gynaecological conditions. This study seeks to report the different indications and outcomes of uterine artery embolization for a variety of gynaecological and obstetrical conditions.

METHODS
30 women who presented for uterine artery embolization in a tertiary care teaching hospital in eastern India from June 2016 to May 2017 were retrospectively studied with follow-up up to 12 months for indications, success rate and complications.

RESULTS
Technical success rate was achieved in 96.67% of cases. The most common indication for embolization was uterine fibroids. Mean reduction of fibroid volume was 51.7% at 6 weeks, 67.9% at 6 months. Most common complaint following embolization was pelvic pain, which could be managed conservatively.

CONCLUSIONS
Uterine artery embolization is a safe and effective minimally invasive technique which can be used to manage different obstetrical and gynaecological conditions with high technical success rate and minimal complications. It is also a minimally invasive, uterus sparing treatment option in patients willing to preserve their fertility.

KEYWORDS
Uterine Artery Embolization, Embolization, Therapeutic, Interventional Radiology, Fibroid, Fibroid Uterus, Post-Partum Hemorrhage, Uterine AV Malformations, Ectopic Pregnancy


BACKGROUND
Uterine Artery Embolization (UAE) has been used for a variety of gynaecological and obstetrical conditions for the past three decades. UAE is an Interventional Radiology procedure usually done via femoral artery access. Following arterial access, catheter is passed into the uterine artery with the help of guidewires. Once, the catheter is in appropriate position, embolic agents are injected in small amounts in the uterine artery branches. A variety of embolic agents can be used, one of them small polyvinyl alcohol (PVA) particles. Embolization have been used to in the management of acute bleeding after childbirth or after gynaecological operations since the 1970s.1,2 The use of pre-operative uterine artery embolization for symptomatic fibroids was first reported by Ravina et al in their work in 1995.3 Since then, there has been a rapid increase in the use of trans catheter embolization for fibroids all over the world. The use of UAE has now expanded to include various conditions such as arterio-venous malformations, ectopic pregnancy, obstetrical haemorrhage etc. It has now become an accepted option for the treatment of symptomatic fibroids and other gynaecological conditions and recognized by National Institute for Health and Care Excellence (NICE) (UK) in its guidelines for heavy menstrual bleeding. This study seeks to report the different indications and outcomes of uterine artery embolization for variety of gynaecological and obstetrical conditions.

METHODS
This retrospective study was conducted with 30 women who consecutively underwent Uterine Artery Embolization in a tertiary care teaching hospital in eastern India for different gynaecological conditions from June 2016 to May 2017.

Inclusion Criteria
- Patients with symptomatic fibroids, desiring treatment.
- Symptomatic fibroids and comorbidities posing a risk to surgery.
- Obstetrical hemorrhage with desire to preserve fertility.
- Those giving consent to the procedure.
Exclusion Criteria
- Patients not giving consent for procedure.
- Patients having fibroids without any symptoms.
- Patients with previous known allergy to contrast agent.
- Any evidence of current or recent genital tract infections,
- Intra-uterine pregnancy.

As part of preprocedural workup, all patients scheduled for UAE underwent pelvic sonography and MRI (in selected cases), routine blood work including hemogram and coagulation profile was also done. All patients were followed up with clinical examination and sonography at 6 weeks, 6 months, 12 months post procedure. UAE was done in the Interventional Radiology Suite using puncture of both Common Femoral Arteries under local anaesthesia. Left Uterine artery was approached through the Right Common femoral artery route and vice-versa. Arterial puncture was done using 18G puncture needle, 5F access sheath was used to secure access into the arterial system. Aorta and iliac arteries were catheterized using 5F catheter (Cook) and 0.035-inch hydrophilic guidewires (terumo). Uterine Arteries were subsequently catheterised using 3F microcatheters (Cook), embolizing agents used were 300 um and 500 um PVA particles. Post embolization check angiography was done to confirm successful embolization.

RESULTS

<table>
<thead>
<tr>
<th>Characteristics of Group</th>
<th>Mean</th>
<th>Std Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>38.35</td>
<td>5.01</td>
</tr>
<tr>
<td>Gravida</td>
<td>2.6</td>
<td>0.56</td>
</tr>
<tr>
<td>Parity</td>
<td>2.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Complaints</td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>Bleeding per vagina</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Dysmenorrhea</td>
<td>7</td>
<td>23.3</td>
</tr>
<tr>
<td>Menorrhagia</td>
<td>17</td>
<td>56.7</td>
</tr>
</tbody>
</table>

Table 1. Characteristics of Study Population

<table>
<thead>
<tr>
<th>Indications</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVM</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>Cervical Ectopic</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Fibroid</td>
<td>24</td>
<td>80.0</td>
</tr>
<tr>
<td>PPH</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 2. Indications and Complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>23</td>
<td>76.7</td>
</tr>
<tr>
<td>Puncture site hematoma</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Pain</td>
<td>6</td>
<td>20.0</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100.0</td>
</tr>
</tbody>
</table>

30 women were taken up for Uterine Artery Embolization in the study. The mean age group of the study population was 38.37 ± 5.02 years, the mean gravida and parity of the study population was 2.6 ± 0.56 and 2.23 ± 0.50 respectively. 24 cases (80%) were taken up for embolization.
for uterine fibroids, 3 cases (10%) due to suspected arteriovenous malformation, 2 cases (6.7%) for secondary post-partum haemorrhage and 1 case (3.3%) for cervical ectopic pregnancy. Embolization could be successfully done in 29 cases (96.67%). Menorrhagia was the most common complaint if the study group, present in 17 cases (56.7%), with dysmenorrhea and bleeding per vagina in 7 and 6 cases respectively. 2 cases (6.67%) had previous myomectomy before embolization. Following embolization, majority cases (76.7%) showed no complications. 6 cases (20%) reported pelvic pain which was controlled by analgesics. There was a puncture site hematoma in 1 (3.3%) case. Mean pre-embolization volume of fibroid in study group was 41.13 cc. Mean volume of fibroid by sonography at 6 weeks, 6 months and 12 months post embolization was 21.21 cc, 13.23 cc, and 11.875 cc respectively. Mean reduction of fibroid volume was 51.7% at 6 weeks, 67.9% at 6 months.

**DISCUSSION**

Uterine Artery Embolization is a safe and efficient Interventional Radiology technique used in different gynaecological and obstetrical conditions for more than 50 years. Uterine artery embolization was done in a Digital Subtraction Angiography (DSA) suite. The procedure was done under local anaesthesia, intravenous analgesic - ibuprofen was used to alleviate any pain/discomfort the patient might have during the procedure. Using proper sterile precautions, arterial system was accessed via the Common Femoral artery in the groin with a 5F access sheath and using Ultrasound guidance for the puncture. UAE is also possible using Trans-radial access, some literature suggests trans-radial access can be a suitable alternative to the transfemoral access. The trans radial route allows the patient to self-compress and allows early ambulation following procedure. Following arterial access, diagnostic aortography was done followed by selective and super-selective angiotherapy of the uterine artery. A 5F catheter (Cook) was used to reach the internal iliac artery and a 3F microcatheter (Cook) was used to access the uterine artery and its branches. Following confirmation of the catheter position in the uterine artery by a check angiography, embolization was done using polyvinyl alcohol (PVA) particles. Embolic agents can be temporary or permanent embolic agents. Temporary agents include gelatin sponge, that allows vessel recanalization after several weeks. Permanent embolic agents include particles, such as PVA and microspheres, metallic coils, plugs and liquid polymers. Studies have shown that embolization is technically easier with the calibrated microspheres. Microspheres have a more uniform size than PVA particles and causes a predictable level of embolization with minimal clogging of catheters. However, in our center, we have used PVA particles as standard embolizing agent in all the cases.

Our objective of this study was to evaluate the use of UAE in different cases of obstetrics and gynaecology and its outcomes. Although the technique and results of Uterine Artery Embolization have been documented well in literature and a number of studies done in resto of world, in our knowledge no previous study regarding the different indications, limitations and outcomes of UAE has been done involving the eastern part of India. Different uses and outcomes of UAE, performed in a premier institute in eastern India catering to a large population of people has been retrospectively analysed in this study. Technical success in embolization was achieved in 96% of cases, this is comparable to the studies done previously in the West, reporting technical success in 95-99% of cases. The most common reason for technical failure is difficulty in cannulation of arteries. In our study, UAE could not be done in 1 case as the uterine artery was narrow and tortuous for the catheter to pass through.

The most common indication for UAE in our study population was for uterine fibroid embolization. Uterine fibroids are benign tumours of myometrial origin, occurring in 25% women in reproductive age. They maybe asymptomatic or present with pain, dysmenorrhea or menorrhagia. According to guidelines issued by Royal College of Obstetricians and Gynaecologists (RCOG) (2013), the early and medium-term results of UAE are good and it is as effective as surgery for symptom control. UAE is recommended alongside surgery as one of the treatment options for fibroids. Patients selection for UAE was done involving team of gynaecologists and radiologists. Prior to embolization pre-procedural imaging was done to confirm the diagnosis, location of pathology and anatomy of the pelvic organs. Ultrasonography was done routinely in all patients. Transabdominal sonography with Transvaginal sonography was done, if required. Although, ultrasound is a less sensitive imaging modality for pelvic pathology, its advantages include rapid imaging, easy availability and a less expensive imaging modality than MRI. MRI however, allows excellent delineation of anatomy and accurate location of fibroids and other pelvic pathology. MRI, being an expensive modality, was done only in selected cases. Only symptomatic fibroids were chosen for embolization, four patients had comorbidities such as Dilated Cardiomyopathy, Heart Failure where primary surgery was not the first treatment option. Two patients had previous myomectomy for fibroids. During follow-up, volume reduction of fibroid was measured using pelvic ultrasonography. Mean reduction in volume was 51.71% at 6 weeks post procedure and 67.9% at 6 months post procedure. This is comparable to studies done previously which shows dominant fibroid volume reduction between 50-75% at 3-6 months post procedure. Studies comparing transcatheter embolization to surgery have reported similar clinical outcomes for symptom control in both methods with fewer serious complications in UAE. A Cochrane review (2014) evaluated seven randomized control trials of UAE with surgery, hysterectomy and myomectomy and found that there was less morbidity with UAE, less major complication, shorter hospital stays and similar patient satisfaction rates.

There were three cases of arterio-venous malformation which were suspected on ultrasonography and confirmed by intraoperative angiography. All the cases were in...
reproductive age group presenting with intermittent bleeding per vagina and had recent history of dilatation and curettage. These are acquired AVMs representing arteriovenous communications between uterine artery branches and myometrial venous plexuses. Acquired uterine AVMs consist of vascular connections and often result from prior instrumentation (caesarean section, dilation and curettage), retained products of conception, endometriosis, gestational trophoblastic disease, or gynaecologic malignancy. UAE has now become an efficient and minimally invasive modality to manage AVMs in women who want to preserve their fertility. In all our cases, bleeding due to the AVM was successfully controlled following transcatheter embolization. Regarding future fertility, prognosis is likely favourable as selective embolization preserves ovarian vascularity. However, long standing study regarding outcomes of fertility in UAE is still limited.

Two cases in our study presented with secondary post-partum haemorrhage. Postpartum haemorrhage is one of the major cases of maternal mortality worldwide. Secondary post-partum haemorrhage is bleeding occurring 24 hours after birth and up to 6 weeks. The most common cause of secondary post-partum haemorrhage is retained products of conception. In uncontrolled post-partum haemorrhage, exploratory laparotomy with possible hysterectomy is used as a life saving measure. In such cases, PPH patients may benefit from transcatheter embolization. Brown (1979) first carried out transcatheter embolization for obstetric haemorrhage. Since then, a cumulative success rate of 97% has been reported for transcatheter embolization in post-partum haemorrhage. The high technical success rate, low complications, uterus preserving outcome has made uterine artery embolization a highly attractive treatment option. In our study, both the cases were successfully embolized with subsequent management of bleeding, thus obviating the need for conventional surgery in the patients.

There was one case of cervical ectopic pregnancy which was diagnosed by ultrasonography initially. She was managed with three doses of methotrexate injection and transcatheter embolization of right uterine artery. Cervical ectopic pregnancy has a low incidence, being around 1% of ectopic pregnancies. However, there is a high risk of life-threatening haemorrhage in cervical ectopic pregnancy. Transcatheter embolization to reduce the risk of haemorrhage and avoid surgery was reported by Cosin. Combined approach using both methotrexate and transcatheter embolization was successful in managing the patient in our case as was reported by Radhakrishna (2014).

Potential complications following embolization include angiographic complications such as puncture site hematoma, contrast reaction, vascular dissection, pelvic pain, non-target embolization, post embolization syndrome. Other related complications include ovarian and sexual dysfunction, expulsion of fibroid and subcutaneous necrosis. Post embolization syndrome is characterized by fever, pain, leukocytosis following embolization and lasting several days. It is usually treated by analgesic and anti-inflammatory medications. However, current studies report complication rates to be around 1-3%, most common being post UAE pelvic pain. Complications following procedure were minimum in our study, with majority of patients, reporting no complications following procedure. 6 cases (20%) reported pelvic pain following the procedure which was managed conservatively with oral analgesics and subsided within 3 days. Puncture site hematoma occurred in 1 case (3.33%), however it could be managed conservatively with compression and ultrasound follow-up.

**CONCLUSIONS**

Uterine Artery Embolization has emerged as a safe and effective Interventional Radiology technique in the management of various obstetrical and gynaecological conditions. It has a high technical success rate and a low rate of complications. It is an effective alternative treatment option in patients wanting to preserve fertility, avoid conventional surgery and for those who are poor candidates for surgery. However, the limited access to embolization facilities and skilled personnel, limits its use to large tertiary care centers.

**REFERENCES**


