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Original Article

Uterine artery embolisation for uterine fibroids: Our experience at a tertiary care service hospital

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ABSTRACT

Background: Uterine artery embolisation (UAE) has evolved as a minimally invasive and effective alternative, treatment modality for women with symptomatic fibroids. We discuss our initial experience of UAE in the management of symptomatic fibroids.

Methods: Twenty five symptomatic patients of uterine fibroids were treated with UAE by selectively cannulating and injecting poly vinyl alcohol particles into the uterine arteries. Post treatment follow up was done at 2 and 6 months respectively.

Results: Pre-treatment, the sizes of fibroids were between 3.9 and 10.9 cm (mean 7.4) on ultrasonography. Of the total 25 patients, 49 uterine arteries were embolised with a technical success rate of 98%. Menorrhagia persisted in 7 patients, dysmenorrhea in 4 patients and pressure symptoms in 2 patients respectively in follow up study of six months which corresponds to a reduction in symptoms by 68% for menorrhagia, 71% for dysmenorrhea and 75% for those with pressure symptoms respectively. At 2 months follow-up post embolisation, the mean diameter of the fibroid was 4.03 cm (range 2–5.2 cm) and at 6 months 3.2 cm (range 1.3–4.1 cm), corresponding to size reduction of 45.5% and 57%, respectively. Follow up with ultrasonography at 2 and 6 months period showed successful fibroid reduction in 24 patients with corresponding reduction in the symptomatology. One patient remained symptomatic with increase in fibroid size and had to undergo hysterectomy.

Conclusion: Uterine artery embolisation can be considered as an alternative to hysterectomy in appropriately selected symptomatic patients of uterine fibroids.

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Introduction

Uterine fibroids (UF) are the most common benign tumor of the uterus in the reproductive age group with an incidence

ranging from 40 to 70%.^{1,2} UF, when small, are frequently asymptomatic. However, a variety of disturbing signs/symptoms like menorrhagia, abdomino-pelvic pain, urinary complaints, infertility etc are known to occur depending on the

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size and location of such fibroids. Traditionally, hysterectomy has been considered as the definitive mode of treatment for symptomatic UF. However, hysterectomy has its own share of morbidity and complications. In the quest of reducing morbidity a variety of semi-invasive and uterus preserving surgeries have been developed in the last few decades besides medical treatment. Medical therapy with progestational compounds has not been conclusively proven to benefit the patients of symptomatic UF.^{3,4} Uterine artery embolisation (UAE) has fast become an increasingly acceptable minimally invasive alternative treatment option with uterus preservation for symptomatic UF.^{5–7} Significant improvement in quality of life and clinical response has been documented by various authors from time to time.^{6,8,9} We present our experience of UAE in treating symptomatic UF at a tertiary care service hospital.

Material and methods

This was a prospective longitudinal study conducted over a period of approximately three years (2003–2006) wherein 25 female patients with symptoms related to UF were treated with UAE by selectively cannulating and injecting poly vinyl alcohol (PVA) particles into the uterine arteries bilaterally.

Inclusion criteria

The study population included female patients in the reproductive age group having symptomatic UF and were willing for complete follow-up study. Informed consent was taken from each subject. In addition, all patients included in this study had normal Pap smear in last twelve months with regular menstrual cycles and normal kidney function. They also agreed not to use any type of hormonal contraception from three months pre-treatment and throughout the study up to the completion.

Exclusion criteria

Patients who were pregnant or desiring pregnancy were not included in the study population. The exclusion criteria were

extended to patients with known gynecologic malignancy or pre-malignancy status, adenomyosis, pelvic infection or history of pelvic inflammatory diseases. Patients on any drug treatment for UF were not included in the group. Other exclusion criteria were undiagnosed extrauterine pelvic mass, coagulopathy disorder, history of pelvic irradiation, uterine A–V fistula and patients with allergy to iodinated contrast.

Equipment

Pre and post procedure sonography was done for all patients using 3.5 and 5 MHz transabdominal probes [Wipro GE, Logic 400 or 500]. UAE procedure was carried out using SIEMENS 1000 mA Digital Subtraction Angiography Machine.

Procedure of UAE

Arterial access was gained in all patients percutaneously via the transfemoral route. Arteriography was performed for uterine and ovarian artery to delineate the vascular supply of the fibroids. Selective catheterization of the contra-lateral internal iliac artery using a Cobra catheter was done under fluoroscopic guidance. The Cobra catheter was advanced into the contralateral uterine artery and selective angiography performed. Subsequently, the catheter was advanced into the transverse portion of the uterine artery with the help of a guide wire and position checked angiographically (Fig. 1a). Poly vinyl alcohol particles (255–500 micron size) were injected until stasis of blood flow was achieved. The end point was to achieve embolisation of the branches to the fibroids but preserve flow in the main uterine artery (Fig. 1b). The catheter was then placed into the ipsilateral uterine artery and embolisation procedure repeated. This was achieved by forming a Waltman loop or by exchanging the Cobra catheter for a Simmons or Shepherds crook catheter (Fig. 2a,b).

Post procedure management

Adequate hydration, analgesics, antiemetic therapy and antibiotics were administered. After discharge, patients were prescribed to take oral antibiotics and analgesics for five days

Fig. 1 – (a): Selective left uterine arteriogram showing arterial supply to the fibroid pre embolisation (b) post embolisation.

Fig. 2 – (a) Selective ipsilateral uterine arteriogram showing arterial supply to the fibroid pre. (b) post embolisation.

post discharge. All patients were advised follow up at two and six months at the gynecology and radiology department. Patients' symptoms and size of the fibroid/s at USG was noted during follow up (Fig. 3).

Results

25 female patients with symptomatic UF (leiomyomas) were treated with selective arterial cannulation and embolisation of the uterine arteries. Age group of patients ranged from 30 to 45 years with mean age of 36 years. The most common age group affected was between 35 and 40 yrs. There were 4 patients (16%) with a single dominant fibroid, 11 (44%) had two to five fibroids and 10 (40%) had more than five fibroids. 22 (88%) patients presented with menorrhagia, 14 (56%) with dysmenorrhoea and 8 (32%) with pressure symptoms. There were 4 (16%) patients presenting with nonspecific symptoms.

Bilateral UAE was performed in 24 (96%) and unilateral UAE in 1 (4%) patients. In one case of unilateral UAE, the contralateral artery could not be embolised because of congenital hypoplasia. Thus, out of total 25 patients 49 uterine arteries

were embolised with a technical success was 98%. The average hospital stay was four days. Post procedure 16 (64%) patients had pelvic pain, 5 (20%) had post embolisation syndrome (PES), 1 (4%) each had ovarian failure, sexual dysfunction, non target embolisation and local complication in the form of a small hematoma at the puncture site respectively (Fig. 4). Post operative pelvic pain, was well controlled by analgesics. Six (24%) women with large fibroids developed delayed symptoms 1–2 days after embolisation consisting of fever, nausea and pelvic pain. The same was successfully treated with nonsteroidal anti-inflammatory analgesic drugs. One (4%) patient complained of amenorrhea two months after the procedure. 4 (16%) patients passed fibroid tissue per vaginum.

Most patients (96%) had decrease in severity of symptoms and were satisfied at the end of two month post procedural follow up. However, at the end of two months one patient (04%) was dissatisfied because of sudden increase in the size of fibroid and had to undergo hysterectomy subsequently. However at six month follow up, there was recurrence of symptoms with 7 patients having menorrhagia, 4 patients having dysmenorrhoea and pressure symptoms were present in 2 patients. This corresponds to reduction in symptoms by

Fig. 3 – (a-b): USG comparing size of fibroid pre embolisation (8.8 cm) and post embolisation (3.4 cm) at 6 months follow up of the same case as in Fig. 1.

Fig. 4 – Post UAE complications.

68% in respect of menorrhagia, 71% in respect of dysmenorrhoea and 75% in respect of pressure symptoms respectively.

The size of fibroid pre and post-embolisation were compared on USG (Fig. 3, Table 1). Before embolisation, the average diameter of the largest leiomyoma was 7.4 cm with a range of 3.9 cm–10.9 cm. Most of them were intramural and multiple leiomyomas (more than five) were seen in 10 patients (40%). At two month follow up, the mean diameter of the fibroid was 4.03 cm (range 2–5.2 cm), at six months 3.2 cm (range 1.3–4.1 cm), corresponding to size reduction of

45.5% and 57%, respectively. The size reduction was associated with corresponding reduction in symptoms respectively.

Discussion

Uterine fibroid is a common cause for distressing symptoms and signs in women of reproductive age group. Uterine preservation therapeutic options for UF include several modalities like myomectomy (abdominal/vaginal/hysteroscopic), mayolysis, endometrial ablation, uterine artery occlusion, uterine artery embolisation, medical therapy with gonadotrophin releasing hormone agonist, progestational compounds etc. Recently, MRI guided focused high frequency ultrasound therapy has also been tried.²

UAE is a safe alternative to more invasive surgical treatments for the management of symptomatic UF. UAE has been used effectively in various conditions like obstetric hemorrhage, post traumatic/postsurgical bleeding, ectopic pregnancy, placenta accreta, and vascular malformation etc.^{10,11} We studied the utility of UAE in 25 female patients with symptomatic UF.

Technical success rate of 98% as reported in this study is comparable with results reported in earlier studies in various centers.^{5,6,12–15} As mentioned in the result section, contralateral uterine artery could not be embolised in one patient due to congenital hypoplasia. Causes of failure to bilaterally embolise at the first attempt include difficulties in catheterizing small tortuous arteries, variant anatomy like congenitally absent or traumatically damaged arteries etc.

In our study, embolisation was performed by using a single 5-F catheter in 14 (56%) patients. 7 (28%) required use of multiple catheters and in 4 (16%) patients, a 3-F micro catheter was needed because of flow-limiting arterial spasm. Micro catheters were used more often than the low rates of 6% (5 of 80) and 11% (6 of 53) reported by Pelage et al.¹⁶ and Brunerau et al.¹⁷ respectively. We did not encounter any failure of super selective catheterization as a cause of unilateral embolisation in the present study. Embolisation was performed by using 255–500-μm poly vinyl alcohol (PVA) particles. PVA is a semi

Table 1 – Fibroid size pre and post embolisation (n = 25).

Patient sr. no.	Mean diameter of largest fibroid (cm)		
	Before procedure	At two months follow up	At six months follow up
1	9.87	5.24	2.0
2	7.9	5.1	3.8
3	7.5	5.32	3.76
4	8.8	3.8	3.4
5	5.4	3.5	2.6
6	7.23	3.2	2.9
7	6.5	3.1	2.3
8	3.9	2.67	2.6
9	4.5	2	1.9
10	8.7	5.02	3.9
11	6.9	4.2	2.3
12	7.8	4.0	3.0
13	5.9	3.8	2.9
14	4.8	3.2	2.9
15	6.4	4.7	3.9
16	8.9	4.5	4.1
17	8.0	4.2	3.2
18	7.8	4.0	3.1
19	9.7	5.03	2.6
20	6.3	4.0	3.0
21	7.6	4.8	3.7
22	5.9	3.8	2.8
23	7.8	3.7	2.8
24	7.23	3.2	2.6
25	10.9	4.9	3.0

permanent occlusive agent having a reduced likelihood for recanalization. In our study we had one case of non target embolisation of pelvic muscles evidenced as severe pain in gluteal region, which subsided with analgesics.

Vasospasm is an important cause for technical failure. Vasospasm often limits the flow of embolic material to distal smaller vessels and can be a cause for inadequate treatment/treatment failure. Vasospasm can also result in non target embolisation. Vasospasm was noted in 32% of cases (8 of 25 cases) in this study. In a study involving 197 cases, Pelage et al.¹⁶ noted vasospasm in 26% of cases and vasospasm prevented embolisation in 3% of their cases. Options to overcome vasospasm include waiting till resolution of the spasm, pushing the catheter beyond the spasm, use of a micro catheter, or catheterization after vasodilators. In our study, half (4 of 8) of the cases of vasospasm were treated with the use intra-arterial vasodilators while the remaining cases (4 of 8) were treated by using a combination of 3-F micro catheters and intra-arterial vasodilators.

Total fluoroscopy time is an important consideration during UAE as the ovaries are exposed in the fluoroscopic field during the entire procedure. In this study, the average fluoroscopy time was 22 min which was lower than those reported previously¹⁸ (30.6 min) and is comparable with that reported by Gomez et al.¹⁹ (21.9 min for 20 cases).

We found that pelvic pain was the commonest side effect and complication during UAE with an incidence of 64%. Adequate sedation and analgesia along with patient monitoring is necessary for successful control of post procedural pelvic pain. Post procedural nausea occurs either related to the use of narcotics or as a side effect of fibroid infarction. Anti-emetics were used as on need basis for the same. Uncommon yet serious complication following uterine artery embolisation is the development of premature ovarian failure which may seen in up to 7% of patients.²⁰ In our study out of 25 patients one (4%) had premature amenorrhea diagnosed clinically. Delayed vaginal expulsion of necrotic fragments was encountered in 4 patients (16%), a fact which is documented in the literature.¹⁶ We did not encounter any case of endometritis or pyometra.

The failure of UAE may be of two kinds, early and late. The early failure is well documented in literature and covers technical failure due to unsuccessful catheterization or vasospasm. Late failure occurs when there is persistence of symptoms for more than six months and is often attributed to large subserosal or sub mucosal leiomyomas.

The mean hospital stay in our study was four days which is longer than studies of Worthington–Kirsh et al.⁶ UAE has mostly been reported as an outpatient procedure.¹² In our study all cases were treated as in patient with post procedural medication regimen for 4–6 days for control pain and discomfort as a part of institutional protocol.

Limitations of our study

1) Relatively small number of study population, 2) The study was conducted almost 8–9 years back, 3) Follow up was only up to six months.

However, to the best of our knowledge, data from the Indian subcontinent is very scanty in this regard.

Conclusion

Uterine artery embolisation can be considered as an alternative to hysterectomy in appropriately selected symptomatic patients of UF.

Conflicts of interest

All authors have none to declare.

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REFERENCES

1. Sutton CJ. Treatment of large uterine fibroids. *Br J Obstet Gynaecol.* 1996;103:494–496.
2. Patel A, Malik M, Britten J, Cox J, Catherino WH. Alternative therapies in management of leiomyomas. *Fertil Steril.* 2014;102:649–655.
3. Sangkomkamhang US, Lumbiganon P, Laopaiboon M, Mol BW. Progestogens or progestogen-releasing intrauterine systems for uterine fibroids. *Cochrane Database Syst Rev.* 2013;2. <http://dx.doi.org/10.1002/14651858.CD008994.pub2>. CD008994.
4. Moroni RM, Martins WP, Dias SV, et al. Combined oral contraceptive for treatment of women with uterine fibroids and abnormal uterine bleeding: a systematic review. *Gynecol Obstet Invest.* 2015;79:145–152. <http://dx.doi.org/10.1159/000369390> [Epub ahead of print].
5. Goodwin SC, Vedantham S, McLucas B, Forno AE, Perrella R. Preliminary experience with uterine artery embolization for uterine fibroids. *J Vasc Interv Radiol.* 1997;8:517–526.
6. Worthington-Kirsch RL, Popky GL, Hutchins FL. Uterine arterial embolization for the management of leiomyomas: quality-of-life assessment and clinical response. *Radiology.* 1998;208:625–629.
7. Van der Kooij SM, Hehenkamp WJ, Volkers NA, Birnie E, Ankum WM, Reekers JA. Uterine artery embolization vs hysterectomy in the treatment of symptomatic uterine fibroids: 5-year outcome from the randomized EMMY trial. *Am J Obstet Gynecol.* 2010;203. <http://dx.doi.org/10.1016/j.ajog.2010.01.049>, 105.e1–13.
8. Chang KM, Chen MJ, Lee MH, Huang YD, Chen CS. Fertility and pregnancy outcomes after uterine artery occlusion with or without myomectomy. *Taiwan J Obstet Gynecol.* 2012;51:331–335.
9. Lohle PN, Voogt MJ, De Vries J, et al. Long-term outcome of uterine artery embolization for symptomatic uterine leiomyomas. *J Vasc Interv Radiol.* 2008;19:319–326.
10. Wu CC, Lee MH. Transcatheter arterial embolotherapy: a therapeutic alternative in obstetrics and gynecologic emergencies. *Semin Interv Radiol.* 2006;23:240–248.
11. Singhal S, Singh A, Raghunandan C, Gupta U, Dutt S. Uterine artery embolization: exploring new dimensions in obstetric emergencies. *Oman Med J.* 2014;29:217–219.

12. Goodwin SC, McLucas B, Lee M, et al. Uterine artery embolization for the treatment of uterine leiomyomata midterm results. *J Vasc Interv Radiol*. 1999;10:1159–1165.
13. Golfieri R, Muzzi C, De Iaco P, et al. The percutaneous treatment of uterine fibromas by means of transcatheter arterialembolization. *Radiol Med*. 2000;100:48–55.
14. Siskin GP, Stainken BF, Dowling K, Meo P, Ahn J, Dolen EG. Outpatient uterine artery embolization for symptomatic uterine fibroids: experience in 49 patients. *J Vasc Interv Radiol*. 2000;11:305–311.
15. Chrisman HB, Saker MB, Ryu RK, et al. The impact of uterine fibroid embolization on resumption of menses and ovarian function. *J Vasc Interv Radiol*. 2000;11:699–703.
16. Pelage JP, Le Dref O, Soyer P, et al. Fibroid –related menorrhagia :treatment with superselective embolisation of uterine arteries and midterm follow up. *Radiology*. 2000;215:428–431.
17. Brunereau L, Herbreteau D, Gallas S, et al. Uterine artery embolisation in the primary treatment of uterine leiomyomas ; technical features and prospective follow up with clinical and sonographic examinations in 58 patients. *Am J Roentgenol*. 2000;175:1267–1272.
18. Andrews RT, Brown PH. Uterine arterial embolization: factors influencing patient radiation exposure. *Radiology*. 2000;217:713–722.
19. Gomez-Jorge J, Kuyuong A, Spies J. *Uterine artery anatomy relevant to uterine leiomyomata embolization*. SCVIR UAE Conference, Washington, DC. 2000.
20. Kaump GR, Spies JB. The impact of uterine artery embolization on ovarian function. *J Vasc Interv Radiol*. 2013;24:459–467.