

THREE-DIMENSIONAL COLOR DOPPLER SONOGRAPHIC ASSESSMENT OF CHANGES IN VOLUME AND VASCULARITY OF FIBROIDS - BEFORE AND AFTER UTERINE ARTERY EMBOLIZATION

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Abstract

The purpose of the present study is to prospectively evaluate the accuracy of three-dimensional color doppler sonography in depicting changes in fibroid volume and vascularity of pre and post uterine artery embolisation in patients undergoing treatment of fibroid.. To analyze the efficacy of uterine artery embolisation as assessed by 12 month follow up of clinical outcome and fibroid volume reduction. On pre - UAE US, all patient had fibroids that were mixed /hypo echoic and were hypoechoic on post- UAE US scans. In this study moderate to marked reduction in larger fibroid volume was seen in 72.48% 83.86 % at 6 months, and 88% at 12 months respectively while using PVA with gelfoam combination. Uterine Artery Embolisation for the patients having symptomatic uterine fibroid is an effective and safe alternate treatment with significant reduction in volume and vascularity of fibroid particularly in less than 7 cm fibroids.

INTRODUCTION

AIM

The purpose of the present study is to prospectively evaluate the accuracy of three-dimensional color doppler sonography in depicting changes in fibroid volume and vascularity of pre and post uterine artery embolisation in patients undergoing treatment of fibroid. To analyze the efficacy of uterine artery embolisation as assessed by 12 month follow up of clinical outcome and fibroid volume reduction.

MATERIALS AND METHODS

A Prospective interventional analysis of the 30 uterine artery embolizations [UAE] performed in our institute 2019 -2022 was undertaken. Since it was a prospective study ethical committee approval was obtained. Our Inclusion criteria was women who gave consent to undergo uterine artery embolisation and participate in study with symptomatic fibroid who want to retain their uterus and avoid surgery. Solitary or multiple intramural fibroids of less than 7 cm. Parous women who completed family and age

less than 40 yrs. Ultrasound findings without any degeneration of fibroid. Our exclusion criteria being women with asymptomatic fibroid. Infertile women or parous women who want to conserve uterus for future pregnancy. Fibroids of more than 7 cm or with degenerative changes or hypovascular in Doppler study. Sub mucous or pedunculated sub serosal fibroid. Associated pelvic / adnexal and endometrial pathologies.

Following a detailed history and biochemical evaluation, preprocedure ultrasound was performed with Siemens Antares machine and the volume and vascularity of the fibroid was estimated. Eligible patients were taken up for Bilateral Uterine artery embolization via femoral arterial route, selective catheterization of both Uterine arteries was done using either Cobra Catheter or Roberts Uterine Catheter [RUC]. In difficult cannulation Microcatheters were used. Embolisation materials used were either Gelfoam slurry, Polyvinyl alcohol spheres [330-500µ] or a combination of both. Patients were usually discharged the next day and asked to report for follow up ultrasound scan at 1,3,6 and 12 months following the procedure.

RESULTS

Total of 30 patients between 21 to 40 years underwent UAE. Most patients presented with either menorrhagia or dysmenorrhoea. All patients underwent preprocedural Ultrasound. All 30 patients with fibroids had a single / multiple intramural fibroid ranging in size from 38 ml to 670 ml.

Twenty-three patients [71%] had no co morbidities. Five [15.6%] were non-surgical candidates. Two due to cardiac problems, one who had rheumatic heart disease with mitral stenosis and pulmonary hypertension, and the other who had undergone closed mitral commissurotomy. Two [6.2%] of the patients had uncontrolled diabetes while the other [3.1%] had severe anaemia due to menorrhagia. Twenty-seven patients [83.1%] underwent UAE with both gelfoam and PVA while 14[33.7%] had gelfoam embolisation alone.

During follow up, of the 30 patients, two patients had undergone hysterectomy for recurrence of symptoms or vaginal discharge. All patients reported satisfaction with procedure and had no specific complaints.

Post procedure amenorrhoea was present in 2 patients. All other patients regained normal menstrual flow and regular periods.

Of the 30 patients with fibroids who underwent UAE, follow up was done up to twelve months for all. The mean fibroid volume in these patients was 253cm³preprocedure and at 1,3,6 and 12 months was 168cm³, 87cm³, 54cm³, and 50cm³ respectively. In this study moderate to marked reduction in larger fibroid volume was seen in 72.48% 83.86 % at 6 months, and 88% at 12 months respectively while using PVA with gelfoam combination. There was significant reduction in fibroid volume starting from 3 months onwards. [Table 1]

On pre - UAE US, all patient had fibroids that were mixed /hypo echoic and were hypoechoic on post-UAE US scans.

Four patients had complications. One was a local complication the other three had procedure related minor complications. We did not face any major complications. One patient with rheumatic heart disease had prolonged bleeding from puncture site which was treated by local compression. Of the procedure related complications, one was a small catheter induced dissection of the left Internal Iliac artery. Patient had claudication pain in the buttocks for 2 months which resolved with conservative treatment and was followed up for four years. Two patients developed persistent foul-smelling vaginal discharge and underwent hysterectomy a year later.

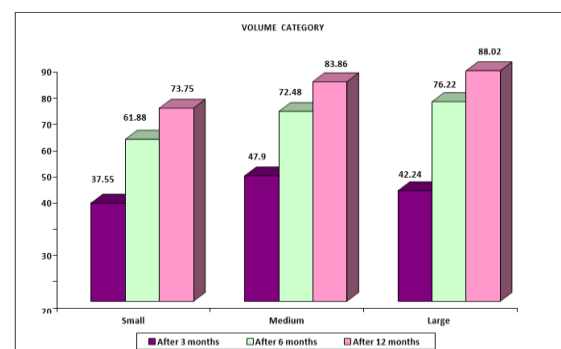
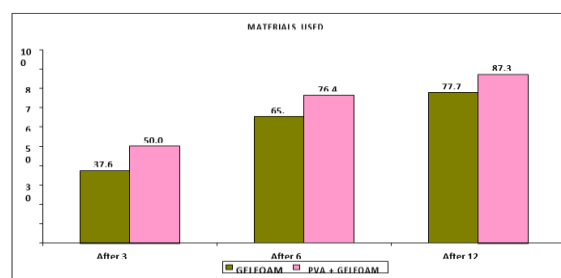
Overall Results

Three-dimensional color Doppler sonographic examination results of volume and vascularity assessment:

Median uterine fibroid size was reduced by 75 – 88%, better reduction is achieved in Bilateral approach – 88.32%, Embolic agents (PVA +Gelfoam) – 88.32%

Large volume fibroid - 88.02%, Dominant fibroid size was reduced by 42%

Clinical improvement: 83% reduction in menorrhagia, 77% reduction in dysmenorrhoea, 86% reduction in urinary frequency (Pressure symptoms).



POST EMBOLISATION REDUCTION PERCENTAGE IN



Figure 1: pre embolisation – 2d usg image to assess fibroid location

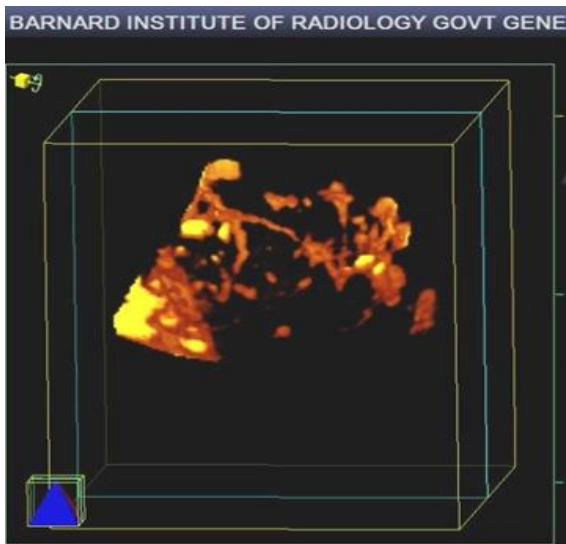


Figure 2: Pre embolisation - 3d color doppler shows hyper vascular fibroid

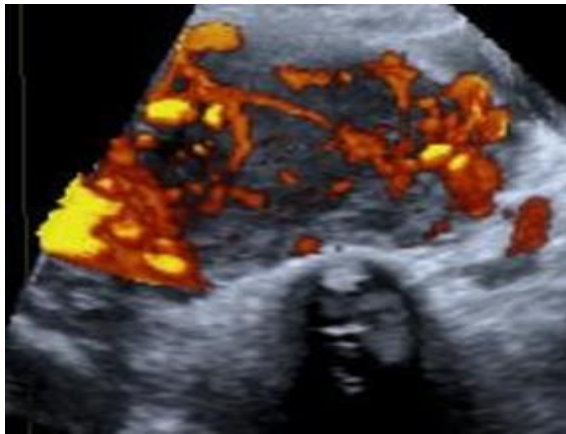


Figure 3: flush aortic angiogram to detect aberrant vascular supply

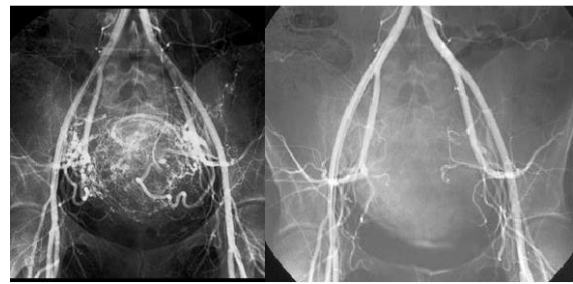


Figure 4: post-embolization pelvic angiography performed to document arterial occlusion

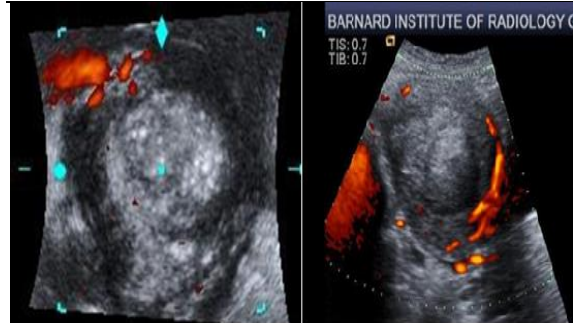


Figure 5: immediate post embolisation 3d color doppler image showing hypovascularity

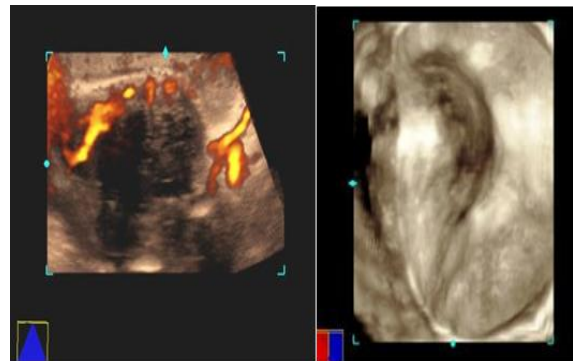


Figure 6: post embolisation 12 months follow up 3d color doppler - 88.02% volume reduction detected and hypovascular

Table 1: Post embolisation reduction percentage in volume of fibroids with differing embolic agents.

Reduction period	Gelfoam	PVA + GELFOAM
After 3 months	37.61	50.04
After 6 months	65.30	76.44
After 12 months	77.76	87.31
P value	<0.001**	<0.001**

P value < 0.001

Note: ** --- denotes significant at 1% level

Table 2: post embolisation reduction percentage in volume of fibroids in differing pre embolisation.

Volume category	Fibroid volume categories.		
	Small (<50 cu.cm)	Medium (50-150 cu.cm)	Large (>150 cu.cm)
After 3 months	37.55	47.90	42.24
After 6 months	61.88	72.48	76.22
After 12 months	73.75	83.86	88.02
P value	<0.001**	<0.001**	<0.001**

P value < 0.001

Note: ** ---denotes significant at 1% level

Table 3: Volume of fibroids in overall assessment.

Reduction Period	Gelfoam	PVA + Gelfoam	Smaller volume fibroid	Medium volume fibroid	Large volume fibroid
After 3 months	37.61	50.04	37.55	47.90	42.24

After 6 months	65.30	76.44	61.88	72.48	76.22
After 12 months	77.76	87.31	73.75	83.86	88.02
P value	<0.001**	<0.001**	<0.001**	<0.001**	<0.001**

P value < 0.001

Note: ** ---denotes significant at 1% level

DISCUSSION

Uterine artery embolization [Figure 1] is a minimally invasive procedure in the treatment of uterine fibroids as an alternative to hysterectomy. Trans catheter embolisation of the uterine arteries for symptomatic fibroids was first reported by Ravine et al in 1995.^[1] It has become an accepted alternative to surgical and medical treatment for symptomatic fibroids. The goal of performing UAE in fibroids is to produce infarction of fibroids while maintaining endometrial and myometrial perfusion.

Various studies have documented a reduction in bleeding and decrease in size of uterine fibroid. Mean fibroid volume reduction has been reported as 69%.^[1] In our series the mean reduction was 81% at end of one year. This is better than previously reported volume reduction of 59% at 3 months and 75% at 12 months,^[2] where authors used only PVA particles. Quality of life improved for most patients after UAE. Complication rates are about 8.5% short term and 1.25% long term complications.^[3] Major complications include expulsion of necrotic fibroid, Infection of endometrium, tubes or ovaries, Deep Venous thrombosis and rarely pulmonary embolism. Infection related complications are about 2%.^[4] Two of our patients had persistent foul-smelling discharge and opted for hysterectomy after one year. Menstrual dysfunction usually improves after UAE. Some women experience amenorrhoea post procedure. Premature ovarian failure or ovarian dysfunction can occur in up to 14% of patients.^[5] It occurs due to embolisation of ovaries via arterial communications between uterine and ovarian arteries. Therefore, women who wish to bear children after UAE must be suitably informed of this probable complication. Women over 45 years are at a higher risk for ovarian dysfunction as they have a higher prevalence [43%] of uterine ovarian anastomoses compared with women less than 45 years of age [$<5\%$].^[4] In our study two patients [6%] had ovarian dysfunction and is comparable to literature reported incidence. The two women were 40 years and 45 years of age at time of procedure. The higher percentage of amenorrhoea in our study may be explained by smaller volume of patients studied and that both patients were above 40 years of age.

Regrowth of fibroid though not a complication perse can be taken as a failure of treatment. Regrowth may be due to inadequate embolisation due to type of particle, extent of embolization or due to restoration of collateral flow to fibroid.⁶ Particle size if larger can cause proximal occlusion without obliterating the capillary bed of the fibroid permitting collaterals to bypass the obstruction. The other possible reason of

post UAE fibroid occurrence can be due to growth of newer fibroids rather than regrowth. In our series we experienced a marginal increase in size in two fibroids within the one year follow up, but the overall size was less than the pre procedural volume.

Minor complications include local and systemic complications. Local complications include hematoma, urinary tract infections, transient pain and vessel or nerve injury at local site.^[6]

Follow up imaging is usually performed by Ultrasound [Figure 2] and Doppler [Figure 3] which is cost effective though MRI would be ideal. Volume reduction of up to 70% has been reported in dominant fibroid. Maximum reduction occurs within a 6-month period followed by further reduction between 6-12 month period.^[5] [Figure 4-6]

Both MRI and Ultrasound are used for follow up. We used ultrasound as it was cost effective and easily available. The mean reduction in fibroid volume was statistically significant in our study and comparable to previously reported reduction rates.^[2]

CONCLUSION

In conclusion UAE is successful in treatment of menorrhagia and results in good reduction in fibroid volumes. Clinical outcome is excellent and procedure is safe with only minor treatable complications. The procedure was found effective in our series even for those who were non-surgical candidates. Ultrasound alone with three-dimensional volume estimation is adequate for follow up of patients post UAE.

Descriptives statistics: reduction percentage in volume of fibroids over time assessment.

REFERENCES

1. Ravina JH, Herbreteau D, Ciraru-Vigneron N, Bouret JM, Houdart E, Aymard A, et al. Arterial embolization to treat uterine myomata. *Lancet* 1995;346:671-2.
2. TP.Jain ,DN.Srivatsa,RP.Sahu et al. Uterine artery embolization for symptomatic fibroids with imaging follow up. *Australasian Radiology* [2007]51,246-252.
3. Spies JB, Spector A, Roth AR, Baker CM, Mauro L, Murphy-Skrynarz K. Complications after uterine artery embolization for leiomyomas. *ObstetGynecol* 2002;100:873-880.
4. Chrisman HB, Saker MB, Ryu RK, et al. The impact of uterine fibroid embolization on resumption of menses and ovarian function. *J VascInterventRadiol* 2000;11:699-703.
5. Ghai MD, Dheeraj K, Rajan MD, FRCPC, FSIR, Mathew S, Benjamin MD, et al. Uterine artery Embolisation for leiomyomas : Pre and Post procedure evaluation with US. *Radiographics*. 2005; 25:1159-1176 • Published online 10.1148/rg.255045019.
6. Imaging manifestations of complications associated with uterine artery embolization. Yuri Kitamura, MD2 • Susan M. Ascher, MD • Cirrelda Cooper, MD et al. *RadioGraphics* 2005;25:S119-S132