ORIGINAL RESEARCH PAPER

Radiology

OUTCOME OF UTERINE ARTERY EMBOLIZATION – A 12 MONTH FOLLOW UP OF CLINICAL OUTCOME AND FIBROID VOLUME REDUCTION

KEY WORDS: Uterine Artery Embolization, Fibroid, Myomectomy, Hysterectomy

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ABSTRACT

Background : Uterine fibroid or leiomyomas are the most common benign uterine tumors and may be seen in upto 40 % of women in reproductive age. Though benign, fibroids are usually symptomatic and the associated menorrhagia hampers routine activities. Uterine artery embolisation [UAE] is an accepted alternative to surgical and medical treatment for symptomatic fibroids

Objective : To analyze the efficacy of uterine artery embolization with reference to fibroid volume reduction as assessed by ultrasound.

Methods: 32 patients between 21 to 45 years of age underwent UAE between 2010 and 2016. Following biochemical evaluation, preprocedure ultrasound with fibroid volume estimation was done using a Siemens Antares machine. Embolization of bilateral uterine arteries was carried out using gelfoam and Polyvinylalcohol spheres[330-500].Post procedure ultrasound was done at 1,3,6 and 12 months .

Results: Of the 32 patients , pre procedure ultrasound revealed fibroids in 26, molar pregnancy in 2, retained products in 2, adenomyosis and arteriovenous malformation in one each. Co morbidities included cardiac problems, uncontrolled diabetes, severe anemia and thyroid cancer. Post procedure 2 patients underwent hysterectomy, 2 developed amenorrhea, rest regained regular menstrual flow.

Of the 26 patients with fibroids pre procedure mean fibroid volume was 253cm$^{3.}$ Mean reduction in Fibroid volume was 34%, 66%, 79% and 81% at 1,3,6 and 12 months. The mean reduction in fibroid volume was statistically significant.

Conclusion: UAE is an effective method in treatment of Fibroids and Ultrasound with volume estimation is adequate for follow up.

INTRODUCTION

Fibroids occur in about 40 % of premenopausal women. Fibroids cause menorrhagia, chronic abdominal pain or obstructive symptoms. While Conservative management is enough for smaller fibroids, symptomatic larger ones are treated by surgery or uterine artery embolization. Myomectomy or Hysterectomy are the surgical options available for Fibroid management. Though curative, the disadvantages of surgery include prolonged hospital stay, post-operative complications, infertility [following hysterectomy] and high recurrence rate [following Myomectomy]. The challenge to motherhood and the fear of recurrence following myomectomy has an adverse impact on women mentally. Uterine artery embolization is a part of the armamentarium of fibroid treatment for the past 25 years. Studies on long term outcome however are few, especially in developing countries. No Indian study has established the long-term effects of Uterine fibroid embolization. Therefore, this retrospective analysis was conceptualized to analyze outcomes in lower socioeconomic status group who can ill afford to tackle the prolonged hospital stay and complications associated with surgery.

AIM:

To analyze the efficacy of uterine artery embolization with reference to fibroid volume reduction as assessed by ultrasound.

MATERIALS AND METHODS:

This observational cohort study was a retrospective analysis of the 32 uterine artery embolization's [UAE] performed in our institute between 2010 and 2016. Since it was a retrospective study ethical committee approval was not required, but ethical approval for the procedure [Uterine artery embolization's -UAE] along with informed consent was obtained. Patients who had undergone UAE were traced from departmental records and were asked to come to the department along with their old medical records. From their records and by individual questioning, data was obtained regarding the clinical symptoms pre and post procedure, date of procedure [UAE], pre and post procedure ultrasound findings. All were subjected to pelvic ultrasound on day of reporting. Those who had undergone hysterectomy were questioned regarding indication and date of surgery. Patients referred for uterine artery embolization had either a history of pain abdomen, menorrhagia or post-partum hemorrhage, uncontrolled by conservative treatment. Details of preprocedural ultrasound [Siemens Antares machine] was recorded. In patients with fibroids, volume of the fibroid was noted. Patients had undergone 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. Embolization materials used were either Geofoam slurry, Polyvinyl alcohol spheres [330-500] 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 32 patients between 21 to 45 years underwent UAE. Most patients presented with either menorrhagia or dysmenorrhea. All patients underwent preprocedural Ultrasound. Ultrasound screening revealed fibroids [twenty-six ,81%], molar pregnancy [two 6.25%], post-partum retained products of conception [two 6.25%] adenomyosis [one , 3.1%] and Arteriovenous malformation [one , 3.1%] .No abnormality was detected by ultrasound in one patient with post cesarean bleed .All 26 patients with fibroids had a single fibroid ranging in size from 38 ml to 670 ml. All fibroids were intramural. There were no pedunculated fibroids in our study.

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 anemia due to menorrhagia. One [3.1%] patient was under treatment for thyroid cancer.

Seventeen patients [53.1%] underwent UAE with both gelfoam and PVA while 14[43.7%] had gelfoam embolization alone. One patient with AVM had coil embolization of uterine artery.

During follow up, of the 32 patients, two patients had undergone hysterectomy for recurrence of symptoms or vaginal discharge. Two patients who underwent UAE for post-partum hemorrhage reported satisfaction with procedure. Of these; one patient with UAE for retained placenta underwent removal of placenta with minimal blood loss and the other with post caesarean bleeding reported cessation of bleeding. The patient with AVM had a repeat procedure where more coils were placed in the Uterine artery. All other patients reported satisfaction with procedure and had no specific complaints.

Post procedure amenorrhea was present in 2 patients. Two patients who underwent pre-operative embolization for molar pregnancy had minimal blood loss during dilation and curettage. All other patients regained normal menstrual flow and regular periods.

Of the 26 patients with fibroids who underwent UAE, follow up was done up to twelve months for all and for 5 years for 2 patients. The mean fibroid volume in these patients was 253cm^{3}preprocedural and at 1,3,6 and 12 months was 168cm^3, 87cm^3, 54cm^3,and 50cm^3 respectively. Mean reduction in Fibroid volume was 34%, 66%, 79% and 81% at 1,3,6 and 12 months respectively. There was significant reduction in fibroid volume starting from 3 months onwards. [TABLE 1]

TABLE -1:Percentage Reduction in fibroid volume on USG follow up and statistical significance.

No.	Months	Mean	Vol reduction. %	P Value
1	0	253.5		
2	1	168.8	34	0.261
3	3	87.2	66	0.021
4	6	54.8	79	0.004
5	12	50.	81	0.003

Four patients had complications. One was a local complication the other three had procedure related minor complications. There were no 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.

DISCUSSION:

Uterine artery embolization [Fig 1] is a minimally invasive procedure in the treatment of postpartum hemorrhage and fibroids as an alternative to hysterectomy. Trans catheter embolization 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. Gradually it was used for other indications like postpartum hemorrhage and Uterine Arteria venous malformations. Recently transient balloon occlusion of both internal iliac or Uterine arteries is performed to control blood loss in placenta previa during cesarean sections. The goal of performing UAE in fibroids is to produce infarction of fibroids while maintaining endometrial and myometrial perfusion.

FIG 1- Selective catheterization of left uterine artery reveals dilated tortuous uterine artery [long arrow] supplying large fibroid. Incidental right Pelvic Kidney [Short arrow].

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 [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 amenorrhea post procedure. Premature ovarian failure or ovarian dysfunction can occur in up to 14% of patients[5]. It occurs due to embolization 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 amenorrhea 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 embolization 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 for 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 of two fibroids within the one year follow up [between 6 to 12 months], but the overall size at 12 months was less than the pre procedural volume. These patients were embolized with gelfoam alone [period during which PVA particles were unavailable in the hospital] which may be the cause of regrowth.

Minor complications include local and systemic complications. Local complications include hematoma,

urinary tract infections, transient pain and vessel or nerve injury at local site.

Follow up imaging is usually performed by Ultrasound [Fig 2] and Doppler [Fig 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] [Fig 4A, B & C]

FIG 2- One-month post embolization ultrasound reveals hyperechoic fibroid. [calipers]

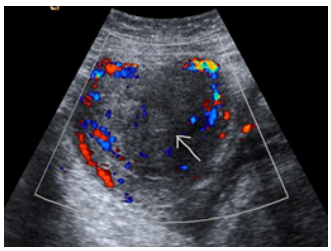

FIG 3 - Doppler reveals hypovascular central fibroid [white arrow] with preserved peripheral myometrial vascularity at one month follow up.

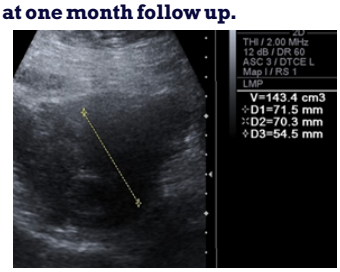

FIG 4 A– Patient with ca thyroid and fibroid embolization: at 3 months follow up USG the fibroid is hypo vascular with volume of 143 cc.

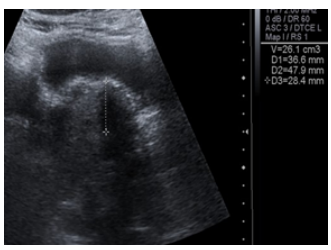

FIG4B –Ultrasound image at 12 months,hypoechoic fibroid[calipers] shrunken to 26cc.

FIG 4C – At 5 years USG reveals complete resolution of fibroid with calcification[Black arrow].

Both MRI and Ultrasound can be 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]

Our study is limited by the smaller number of patients included. Its strength lies in the clinical follow up and Ultrasound screening done post procedure. Also, few patients were followed up to five years and above establishing long term efficacy of UAE. Study sample included lower socio-economic status group, many with co morbidities thus proving its efficacy in both.

Thus it has been established by our study that Uterine Artery Embolization is an effective tool for the management of Uterine fibroids and can prove a boon for non-surgical candidates with co morbidities, patients wishing to increase their family in the future, those wanting to avoid prolonged hospital stay and for those with fear of surgery. The complications are lesser, the time to recover is faster, and patients are left with no cosmetic scars. The resumption of normal periods is psychologically beneficial in most patients as compared to myomectomy or hysterectomy. Myomectomy though a fertility– preserving operation, has a high recurrence rate with increasing postoperative years.[7]

CONCLUSION:

In conclusion UAE is successful in treatment of menorrhagia, post-partum hemorrhage 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 especially with a combination of PVA and Gelfoam, even for those who were non-surgical candidates Many had resumption of normal menstrual cycles. Ultrasound is an easily available, inexpensive tool which with volume estimation is adequate for follow up of patients post UAE.

Competing Interests

The authors declare that they no financial or personal relationship that may have inappropriately influenced them in writing this article.

Authors Contribution

Dr.S. Kalpana and Dr.P. Karthik performed the Uterine artery Embolization's and the preoperative work up. Dr.A. Thangalakshmi contributed towards post-operative follow up of patients, ultrasound screening and compiling the article. Dr. Abna performed contact tracing, follow up and assisted in writing of manuscript. Dr.S. Kalpana conceived the original idea, performed and supervised all UAE, collected data and wrote manuscript. The authors received no financial support for the research, authorship and /or publication of this article.

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Data Availability Statement

The data that support the findings of this study are available from the primary author [Dr.S.Kalpana] corresponding author [Dr.A.Thangalakshmi] upon reasonable request.

Disclaimer:

The views expressed in the submitted article by the authors are based on the data and is not an official position of the institution or funder.

REFERENCES:

1. RavinaJH, 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. Sahuetal. 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. ObstetGynecol2002; 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 VascInterventRadiol2000; 11:699–703.
5. GhaiMD, DheerajK. Rajan, MD, FRCPC, FSIR, MathewS. BenjaminMD, etal. Uterine artery Embolization 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
7. Yasushi Kotani,[1] Takako Tobiume, [1] Risa Fujishima, [1] Mamoru Shigeta, [1] Hisamitsu Takaya, [1] Hidekatsu Nakai, [1] Ayako Suzuki, [1] Isao Tsuji, [1] Masaki Mandai,[2] and Noriomi Matsumura [1] Recurrence of uterine myoma after myomectomy: Open myomectomy versus laparoscopic myomectomy