



ORIGINAL ARTICLE

Uterine Artery Embolization for Fibroid: Pre and Post Procedure Size Response According to the Location

Mohammed Hussain Al Metlag^{1*}, Abeer F Al-Dhawi¹, Sattam Al Russayes², Ibrahim Alrashidi³, Abdulaziz Almathami³, Sultan Nasser Al Ammari³, Fares Ali Ahmed Garad³ and Faisal Al Ahmari³



¹Interventional Radiology Fellow, Prince Sultan Military Medical City, Saudi Arabia

²Diagnostic Radiology Resident, Prince Sultan Military Medical City, Saudi Arabia

³Interventional Radiology Consultant, Prince Sultan Military Medical City, Saudi Arabia

*Corresponding author: Mohammed Hussain Al Metlag, Interventional Radiology Fellow, Prince Sultan Military Medical City, Saudi Arabia, Tel: 966533733330

Abstract

Purpose: To assess the efficacy of uterine artery embolization in reducing the uterine fibroid size according to its location.

Materials and methods: A retrospective record-based study was conducted at interventional radiology department of prince sultan military medical city in Riyadh city. Medical files of all women above 18 years who underwent uterine artery embolization during the period from January 2015 to January 2020 were reviewed. All included women files were initially assessed for their data including age, puncture site, pre- and post-procedure size and location of the fibroids. Post-procedure size change and complications were assessed.

Results: A total of 160 female who underwent uterine artery embolization records for symptomatic fibroid were reviewed and data extracted. Females ages ranged from 18 to 60 years. Fibroid size reduction of less than 50% of its initial size was detected among 38 (44.7%) cases while it was reduced by 50 to 75% of its initial size among 27 (31.8%) cases but 20 (23.5%) cases showed reduction in size exceeding 75% of its initial size.

Conclusions: In conclusion, the study revealed that Uterine artery embolization is an effective less invasive, and safe therapy. The procedure efficacy was more among young females with initially small fibroid masses and the highest reduction (> 50%) in fibroid size was detected among females with fibroid at cervix (71.4%), fundus (70%) and lowest was for females with multiple fibroid (50%) with no statically significance (P = 0.432).

Keywords

Uterine fibroid, Mass, Benign lesion, Uterine artery embolization, Success, Complications

Introduction

Uterine fibroids which are also known as uterine leiomyoma are featured by being benign smooth muscle growths of the uterus [1]. Uterine fibroids are believed the most reported reproductive tract tumors among females that predominate in young menstruating women [2,3]. The overall incidence was recorded on average as 29.7/1000 patient/year, which may vary according to the women age [4-6]. Many researchers reported that the highest incidence was reported among women who are at 40 years of their life [7,8]. Uterine fibroids are amongst the most documented causes of bleeding per vagina [9]. Uterine fibroid is asymptomatic in most cases while some females may experience painful or heavy periods [9]. They may also had pain during intercourse with lower back pain [10]. A woman can have one uterine fibroid or many [9]. Occasionally, fibroids may make it difficult to become pregnant, although this is uncommon.

Uterine artery embolization (UAE) is a procedure in which an interventional radiologist uses a catheter to deliver small particles that block the blood supply to

the uterine body. This minimally invasive procedure is commonly used in the treatment of uterine fibroids and is also called uterine fibroid embolization [10-12]. Fibroid size, number, and location are the main three potential determinants of an effective outcome of embolization intervention [13,14]. Uterine artery embolization showed faster recovery time than traditional surgeries but mostly needs repeated procedures in contrast to if surgery was done initially [11]. It is thought to work because uterine fibroids have abnormal vasculature together with aberrant responses to hypoxia (inadequate oxygenation to tissues) [15]. Uterine artery embolization can also be used to control heavy uterine bleeding for reasons other than fibroids, such as postpartum obstetrical haemorrhage or adenomyosis [16]. The current study aimed to assess the efficacy of uterine artery embolization in reducing the uterine fibroid size according to its location and to report the post-procedure complications.

Materials and Methods

A retrospective record-based study was conducted at interventional radiology department of prince sultan military medical city in Riyadh city. Medical files of all women who underwent uterine artery embolization during the period from January 2015 to January 2020 were reviewed. Females with one or more fibroids that could be subjected to clinical examination followed by MRI and were considered by the patient's physician to justify interventional treatment. Females with fibroid size 2 cm or more were included.

Exclusion criteria included: Uterine malignancy, severe allergy to iodinated contrast media, subserosal pedunculated fibroids, recent or ongoing pelvic inflammatory disease, adenomyosis cases, post-partum haemorrhage cases and presence any contraindication to interventional radiology. The targeted sample was 150 women to estimate an average reduction after embolization in the fibroid size by about 50%-75% [17], with precision of 7% at 95% confidence level. The sample women will be selected consecutively from those who attended the interventional radiology department during the study period.

Baseline assessment

All included women files were initially assessed for their data including age, puncture site, pre- and post-procedure number, size and location of the fibroids.

Intervention technique

The procedure was done under local anesthesia. Urinary bladder was catheterized. Femoral or radial arteries access was done and 6Fr or smaller sheaths was inserted. Abdominal aortogram was done with Pig tail catheter and pelvic vessels were seen and size and origin of uterine arteries from internal iliac arteries was defined. Then, the uterine artery was approached

with selective catheter. Catheter was inserted through femoral artery, then external artery, and common iliac, going to opposite common iliac, internal iliac, and then uterine artery was selectively hooked. Polyvinyl alcohol (PVA) particles of the size of 500-700 micron were pushed through the catheter, mixed in contrast agent. The process was continued till artery was blocked and reflux of contrast was seen. The same procedure was repeated on opposite side.

Post intervention assessment

After embolization procedure is done, women were assessed for change in fibroid size, pain score, symptoms and complications.

Data analysis

After data were collected, it was modified, coded and entered to statistical software IBM SPSS version 22(SPSS, Inc. Chicago, IL). All statistical analysis was done using two tailed tests. P value less than 0.05 was considered to be statistically significant. Descriptive analysis based on frequency and percent distribution was done for all variables including demographic data, fibroid site, location, and size. Fibroid size change % was estimated by calculating the percent in reduction from initial size. Cross tabulation was used to test for distribution of post-procedure fibroid size reduction by patient's bio-demographic data. Exact probability test was used to test for relations significance due to small frequency distributions.

Results

A total of 160 female who underwent uterine artery embolization records were reviewed and data extracted. Female's ages ranged from 18 to 60 years with mean age of 43.5 ± 7.4 -years-old. Bilateral uterine artery embolization was done among 155 (96.9%) females, Transfemoral method of embolization was the dominant among study females (93.8%; 150).

Regarding fibroid site, it was at the body among 43.8% of the patients, followed by being multiple (more the one site) among 29.4% of the cases a, and at fundus among 11.3% of the females (Table 1).

Table 2 shows clinical outcome of uterine artery embolization in reducing the uterine fibroid. Transfemoral technique was used among 150 (93.8%) fibroid cases. Fibroid size reduction of less than 50% of its initial size was detected among 38 (44.7%) cases while it was reduced by 50 to 75% of its initial size among 27 (31.8%) cases but 20 cases showed reduction in size exceeding 75% of its initial size. Regarding enhancement, 40 (25%) cases showed decrease in size and enhancement, 21 (13.1%) showed Decrease in size and necrosis, 6 (3.8%) showed Decrease in enhancement stable in size, while 3 (1.9%) cases had complete regression.

Table 3 illustrates distribution of fibroid size reduction after uterine artery embolization by female's bio-clinical data. Reduction in size by more than 50% was detected among 62% of young, aged females (less than 40 years) compared to 38% of those aged 50 years or more with detected statistical significance ($P = 0.049$). The highest reduction ($> 50\%$) in fibroid size was detected among females with fibroid at cervix (71.4%), fundus (70%) and lowest was for females with multiple fibroid (50%) with no statistical significance ($P = 0.432$). Exact of 55.6% of females undergone transfemoral embolization had significant reduction in fibroid size ($> 50\%$) compared to 50% of trans radial cases ($P = 0.956$).

Table 1: Bio-demographic data of females undergone uterine artery embolization in reducing the uterine fibroid.

	Count	Column N%
Age in years		
< 40	49	30.6%
40-49	71	44.4%
50+	40	25.0%
Uterine artery embolization		
Unilateral	5	3.1%
Bilateral	155	96.9%
Fibroid site		
Body	70	43.8%
Cervix	7	4.4%
Fundus	18	11.3%
Multiple	47	29.4%
No data	18	11.3%

Discussion

The current study aimed to assess the clinical data for fibroid including site, size, and number, assess the

Table 2: Clinical outcome of uterine artery embolization in reducing the uterine fibroid.

Outcome	No	%
Technique		
Trans-femoral approach	150	93.8%
Trans-radial approach	10	6.3%
Fibroid size reduction		
< 50%	38	44.7%
50-75%	27	31.8%
> 75%	20	23.5%
Response		
No data	76	47.5%
Decrease in size and enhancement	40	25.0%
Decrease in size and necrosis	21	13.1%
Decrease in enhancement stable in size	6	3.8%
Decrease in size and stable enhancement	4	2.5%
Stable in size and enhancement	4	2.5%
Complete regression	3	1.9%
No enhancement - Decrease in size	3	1.9%
Stable in size and necrosis	3	1.9%

Table 3: Distribution of fibroid size reduction after uterine artery embolization by female's bio-clinical data.

Factors	Fibroid size reduction						P-value
	< 50%		50-75%		> 75%		
	No	%	No	%	No	%	
Age in years							
< 40	11	37.9%	9	31.0%	9	31.0%	0.049*
40-49	14	40.0%	14	40.0%	7	20.0%	
50+	13	61.9%	4	19.0%	4	19.0%	
Side							
Unilateral	1	100.0%	0	0.0%	0	0.0%	0.535
Blateral	37	44.0%	27	32.1%	20	23.8%	
Mass location							
Body	20	47.6%	14	33.3%	8	19.0%	0.432
Cervix	2	28.6%	1	14.3%	4	57.1%	
Fundus	3	30.0%	5	50.0%	2	20.0%	
Multiple	12	50.0%	7	29.2%	5	20.8%	
No data	1	50.0%	0	0.0%	1	50.0%	
Technique							
Trans-femoral	36	44.4%	26	32.1%	19	23.5%	0.956
Trans-radial	2	50.0%	1	25.0%	1	25.0%	

P: Exact probability test

effect of uterine artery embolization on reducing the fibroid size and enhancement. Uterine fibroids featured as benign monoclonal tumours of the uterus comprised smooth muscle cells and an extracellular matrix of collagen, fibronectin, and proteoglycan [8]. Later on with time, fibroids enlarge with enlargement of the uterus. Submucosal fibroids as well as intramural fibroids that be adjacent to the endometrial lining, are associated with painful and heavy menses [4]. Large fibroids or the overall enlargement of the uterus is associated with local pain, pressure, or compressive impacts. Though, uterine fibroids are benign, considerable symptoms were reported. Uterine artery embolization (UAE) is recently significantly recommended as a minimally invasive, uterine-sparing procedure, with more than 100,000 procedures have been performed during the last few years, mainly in the United States and Western Europe [18]. This new procedure associated with less complications and rapid cure rate and less economic burden [19-21].

Regarding outcome of uterine artery embolization, the study results showed that more than half of the cases recorded significant reduction in the uterine fibroid [22-24] size by more than 50% which was more than 75% among nearly one out of each four females. The only significant predictor for clinically significant reduction in fibroid size was females age as young aged females showed significantly better reduction in their fibroid size after embolization procedure than old, aged females (nearly 2:1). All other factors including fibroid site, used techniques had no significant relation with reduced size.

Uterine artery embolization as a main treatment for fibroids was reported by Ravina in 1995 [25], with an average follow-up of 20 months, symptoms resolved in 11 (16%). Three patients had partial improvement, and the residual heavy bleeding subsequently controlled with progestins. Failed therapy was reported among 2 females, one of which needed hysterectomy 6 weeks after the procedure and another requiring myomectomy 6 month after the procedure. All these findings were like what was reported by Bhardwaj R, et al. [17]. Where authors found that fibroids disappeared in 8 out of 35 patients (22.9%), decreased in size by > 75% in 11 patients (31.4%), and by 50-75% in 6 patients (17.1%). Five patients did not report back with ultrasound. Two patients had normal delivery after UAE. Also, Worthington-Kirsch RL, et al. [26] revealed that the mean reduction in fibroid size post UAE was 46% in with follow-up ultrasound was performed. Only one patient had post-procedure extensive infarction requiring in hysterectomy. Two patients required re-hospitalization for post-embolization syndrome. Another patient developed a self-limited episode of upper gastrointestinal hemorrhage secondary to vomiting.

Conclusions

In conclusion, the study revealed that uterine artery embolization efficacy was more among young females with initially small fibroid masses and the highest reduction (> 50%) in fibroid size was detected among females with fibroid at cervix (71.4%), fundus (70%) and lowest was for females with multiple fibroid (50%) with no statically significance (P = 0.432).

Acknowledgement

Authors acknowledge all survey participants and experts who sheared in tool review and all help.

Ethical Considerations

The study was conducted in accordance with the Declaration of Research Ethics Committee of the Prince Sultan Military Medical City approved the protocol.

Conflict of Interest

The authors declare no conflict of interest.

Sources of Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

1. Evans P, Brunzell S (2007) Uterine fibroid tumors: Diagnosis and treatment. *Am fam physician* 75: 1503-1508.
2. Chen CR, Buck GM, Courey NG, Perez KM, Wactawski-Wende J (2004) Risk factors for uterine fibroids among women undergoing tubal sterilization. *Am J Epidemiol* 153: 20-26.
3. Zimmermann A, Bernuit D, Gerlinger C, Schaefer M, Geppert K (2012) Prevalence, symptoms and management of uterine fibroids: An international internet-based survey of 21,746 women. *BMC Women's Health* 12: 6.
4. Baird DD, Dunson DB, Hill MC, Cousins D, Schectman JM (2003) High cumulative incidence of uterine leiomyoma in black and white women: Ultrasound evidence. *Am J Obstet Gynecol* 188: 100-107.
5. Wise LA, Palmer JR, Harlow BL, Spiegelman D, Stewart EA, et al. (2004) Reproductive factors, hormonal contraception, and risk of uterine leiomyomata in African-american women: A prospective study. *Am J Epidemiol* 159: 113-123.
6. Elugwaraonu O, Okojie AI, Okhia O, Oyadoghan GP (2013) The incidence of uterine fibroid among reproductive age women: A five-year review of cases at ISTH, Irrua, Edo, Nigeria. *International Journal of Basic, Applied and Innovative Research* 2: 55-60.
7. Wise LA, Palmer JR, Stewart EA, Rosenberg L (2005) Age-specific incidence rates for self-reported uterine leiomyomata in the black women's health study. *Obstet Gynecol* 105: 563-568.
8. Flynn M, Jamison M, Datta S, Myers E (2006) Health care's resource use for uterine fibroid tumors in the United States. *Am J Obstet Gynecol* 195: 955-964.
9. Gupta JK, Sinha A, Lumsden MA, Hickey M (2014) Uterine artery embolization for symptomatic uterine fibroids. *Cochrane Database Syst Rev*.

10. Hehenkamp WJ, Volkers NA, Birnie E, Reekers JA, Ankum WM (2008) Symptomatic uterine fibroids: Treatment with uterine artery embolization or hysterectomy-results from the randomized clinical embolisation versus hysterectomy (EMMY) trial. *Radiology* 246: 823-832.
11. Andersen PE, Lund N, Justesen P, Munk T, Elle B, et al. (2001) Uterine artery embolization of symptomatic uterine fibroids: initial success and short-term results. *Acta Radiol* 42: 234-238.
12. Van der Kooij SM, Hehenkamp WJ, Volkers NA, Birnie E, Ankum WM, et al. (2010) Uterine artery embolization vs hysterectomy in the treatment of symptomatic uterine fibroids: 5-year outcome from the randomized EMMY trial. *Am J Obstet Gynecol* 203: 105.e1-105.e13.
13. Spies JB, Roth AR, Jha RC, Gomez-Jorge J, Levy EB, et al. (2002) Leiomyomata treated with uterine artery embolization: Factors associated with successful symptom and imaging outcome. *Radiology* 222: 45-52.
14. Firouznia K, Ghanaati H, Sanaati M, Jalali AH, Shakiba M (2008) Uterine artery embolization in 101 cases of uterine fibroids: Do size, location, and number of fibroids affect therapeutic success and complications. *Cardiovasc Intervent Radiol* 31: 521-526.
15. Tal R, Segars JH (2014) The role of angiogenic factors in fibroid pathogenesis: Potential implications for future therapy. *Hum Reprod Update* 20: 194-216.
16. Wee L, Barron J, Toye R (2004) Management of severe postpartum haemorrhage by uterine artery embolization. *BJA* 93: 591-594.
17. Bhardwaj B (2012) Uterine artery embolization. *Indian Heart J* 64: 305-308.
18. Mohan PP, Hamblin MH, Vogelzang RL (2013) Uterine artery embolization and its effect on fertility. *J Vasc Interv Radiol* 24: 925-930.
19. Smeets AJ, Nijenhuis RJ, Boekkooi PF, Vervest HA, van Rooij WJ, et al. (2009) Safety and effectiveness of uterine artery embolization in patients with pedunculated fibroids. *J Vasc Interv Radiol* 20: 1172-1175.
20. Keung JJ, Spies JB, Caridi TM (2018) Uterine artery embolization: A review of current concepts. *Best Pract Res Clin Obstet Gynaecol* 46: 66-73.
21. Kwon Y, So YH, Kim BJ, Kim SM, Choi YH, et al. (2019) Uterine artery embolization in patients with postpartum hemorrhage: Clinical efficacy and safety of treatment with N-Butyl-2-Cyanoacrylate. *Journal of the Korean Society of Radiology* 80: 88-97.
22. Lumsden MA, Wallace EM (1998) Clinical presentation of uterine fibroids. *Baillieres Clin Obstet Gynaecol* 12: 177-195.
23. Warner PE, Critchley HO, Lumsden MA, Campbell-Brown M, Douglas A, et al. (2004) Menorrhagia I: Measured blood loss, clinical features, and outcome in women with heavy periods: A survey with follow-up data. *Am J Obstet Gynecol* 190: 1216-1223.
24. Stewart EA (2015) Clinical practice. Uterine fibroids. *N Engl J Med* 372: 1646-1655.
25. Ravina JH, Ciraru-Vigneron N, Bouret JM, Herbreteau D, Houdart E, et al. (1995) Arterial embolisation to treat uterine myomata. *Lancet* 346: 671-672.
26. Worthington-Kirsch RL, Popky GL, Hutchins Jr FL (1998) Uterine arterial embolization for the management of leiomyomas: Quality-of-life assessment and clinical response. *Radiology* 208: 625-629.