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Uterine fibroid embolization in treatment of symptomatic fibroid uterus

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Abstract

Uterine artery embolization is minimally invasive, highly effective, well tolerated by most patients. Advantage of this method was uterine sparing, short recovery period, no need for blood transfusion, less anaesthetic complication, etc. Hence Uterine fibroid embolization was an alternate primary treatment to hysterectomy for the management of symptomatic fibroid uterus. Estimates suggest that more than 100000 UFE procedures have been performed worldwide.

Aim: A prospective interventional study of patients with symptomatic uterine leiomyoma in our hospital subjected to uterine artery embolization. This study is to analyse below parameters of uterine symptomatic leiomyoma

1. Technique
2. Effectiveness
3. Complications
4. Outcome of this technique

Materials and Methods: In this study 30 patients having uterine myoma with at least one of the following symptoms are selected:

1. Heavy menstrual bleeding
2. Lower abdominal pain during menstruation (dysmenorrhoea)
3. Urinary symptoms like increased frequency, difficult to micturition.
4. Constipation
5. Lower abdominal heaviness

Study Method: It was a prospective interventional study.

Place of Study: Government RSRM Lying in Hospital, Chennai.

Collaborating Unit: Department of Interventional Radiology.

Results and Conclusion: From this study we have concluded that uterine fibroid embolization found to be an effective, safe and alternate primary treatment to hysterectomy to reduction of symptoms in uterine myoma. On short term follow up, less failure rates observed in this study.

Keywords: Symptomatic, fibroid uterus

Introduction

Uterine leiomyomas, popularly known as fibroids, are benign tumors which arise from smooth muscle cells of uterus. They also contain varying amounts of fibrous tissue. It is the most common tumors in women of reproductive age group. About 30 – 50% of women in perimenopausal age have leiomyomas.

It is a slow growing tumor. Size of the tumor varies from seedling to large ones of several centimeters. It may be single or multiple. It is otherwise called myoma, fibroid, fibromyoma. Exact etiology of tumor is not known. Both estrogen and progesterone appears to promote the development of uterine leiomyomas.

Common symptoms of uterine leiomyomas are:

1. Heavy menstrual bleeding
2. Lower abdominal pain
3. Pain during menstruation (dysmenorrhoea)
4. Pressure symptoms includes
 - a. Urinary symptoms like increased frequency of micturition, urinary retention, difficulty in initiation.
 - b. Bowel symptoms like constipation etc.

5. Lower abdominal heaviness
6. Abdominal lump
7. Infertility, pregnancy losses
8. Very rarely oedema of legs and intestinal obstruction seen in very large fibroids.

According to international federation of obstetrics and gynaecology (FIGO system), fibroids classified into various types according to location. These are submucosal, intramural, suterosal leiomyomas. Among these intramural leiomyoma is the most common type. Various methods of treatment are available for symptomatic uterine fibroids. Medical management of fibroid includes low dose oral contraceptive pills, GnRH agonist, levonorgestrel intrauterine system, mifepristone (RU-486), newer drugs like Asoprisnil, Pirfenidone, Halofuginone etc. These drugs cause temporary relief of symptoms and reduction in fibroid size. But the symptoms and growth of fibroid reoccurs on stopping the drugs.

Surgical management of fibroid includes hysterectomy and myomectomy. Myomectomy is the preferred treatment in young woman with fibroid who wants to preserve their uterus whereas Hysterectomy is preferred for women who have children and are aged more than 40 years. Endometrial ablation technique used to treat symptoms especially heavy menstrual bleeding.

Newer methods of treatment include Myolysis, uterine artery embolization, Magnetic Resonance-Guided Focused Ultrasound Surgery (MRGUS), etc. Uterine artery embolization is minimally invasive, highly effective, well tolerated by most patients. Advantage of this method was uterine sparing, short recovery period, no need for blood transfusion, less anaesthetic complication, etc. Hence Uterine fibroid embolization was an alternate primary treatment to hysterectomy for the management of symptomatic fibroid uterus. Estimates suggest that more than 100000 UFE procedures have been performed worldwide.

Aim of the study

Aim

A prospective interventional study of patients with symptomatic uterine leiomyoma in our hospital subjected to uterine artery embolization. This study is to analyse below parameters of uterine symptomatic leiomyoma:

1. Technique
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Materials and Methods

In this study 30 patients having uterine myoma with at least one of the following symptoms are selected:

1. Heavy menstrual bleeding
2. Lower abdominal pain during menstruation (dysmenorrhoea)
3. Urinary symptoms like increased frequency, difficult to micturition.
4. Constipation
5. Lower abdominal heaviness

These patients are selected and explained about the uterine artery embolization procedure which is minimally invasive, highly effective alternate primary treatment modality to hysterectomy. This is uterine sparing technique which is useful to women who wants to preserve reproductive and menstrual function. Details of procedure explained to the patients includes

technique, expected outcome, advantages and procedure complications, failure of treatment, need for emergency laparotomy, postoperative complications, etc. To get the detailed informed written consent from the patient who willing to participate in this study. These patients further subjected to routine as well as specific investigations before doing the procedure to avoid complications.

Patient selection criteria

Inclusion criteria

1. Women with symptoms of fibroid like heavy menstrual bleeding, dysmenorrhoea, pressure symptoms (Bowel and bladder symptoms) who wants to retain the uterus and avoid surgical complications.
2. Single or multiple number of intramural myoma.
3. Size of myoma less than 7cm included in this study.
4. Women with symptomatic myomas who completed the family
5. Age group more than 30 years
6. Women with uterine myoma who willing to participate in this study.

Exclusion criteria

1. Women without symptoms of myoma uterus
2. Nulligravida and parous women who wants to retain the uterus for future pregnancy
3. Submucous or pedunculated uterine myoma
4. Size of uterine myoma more than 7cm
5. History of allergic to contrast excluded from this study.
6. Renal failure
7. Women with abnormal coagulation profile.
8. Presence of pelvic inflammatory disease, malignancy, pregnancy.

Study method

It is a prospective interventional study.

Place of study

Government RSRM Lying in Hospital, Chennai.

Collaborating unit

Department of Interventional Radiology.

Study population

Patients with symptoms of Uterine myoma who are willing to participate in this study.

Size of sample

30 patients

Methodology

Severity of symptoms of uterine myoma should be assessed by eliciting detailed menstrual history from the patients include duration of flow, amount of flow, passage of clots and associated with pain (dysmenorrhoea) or not. Amount of flow assessed by asking number clothes or pads changed per day and about pad soakage.

Pictorial blood loss assessment chart (PBAC)

It is defined by HIGHAM *et al.* in 1990. It is used to assess amount of blood loss during menstruation. It is a simple and non laboratory scoring system. This score assessed by visual appearance of stained towels, tampons and presence of clots. This scoring system used to assess the blood loss prior to

treatment and to assess the treatment response after the procedure.

This blood loss assessment chart includes

Tampons

Slightly stained each tampon – given as one point.

Moderately soiled each tampon – given as five points.

If tampon soaked with blood completely – given as twenty points

Towel

Slightly stained each towel – given as one point.

Moderately soiled each towel – given as five points.

If towel completely soaked with blood – given as twenty points.

Passage of clots

Passage of small clot – given as one point.

Passage of large clot – given as five points.

Flooding of blood – given as twenty points.

A pictorial blood loss assessment score more than 100 indicates heavy menstrual bleeding (Menorrhagia). It has sensitivity of 86% and specificity of 89%.

Pain during menstruation (Dysmenorrhoea) should be assessed by using visual analogue scale (VAS). It is a continuous line of 10cm. one end of line indicates "No pain at all" and other end indicates "Unbearable pain". In this system, pain measured by asking the patient to mark according to severity of pain on visual analogue scale. From this system, dysmenorrhoea is classified according to the below score:

Mild dysmenorrhoea - (1-3 cm)

Moderate dysmenorrhoea - (4-7 cm)

Severe dysmenorrhoea - (8-10 cm)

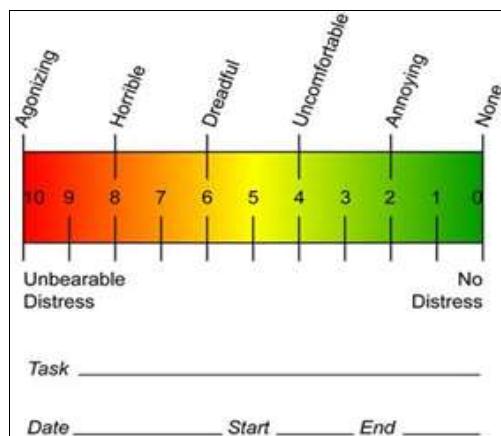


Fig 1: Pressure symptoms assessed by presence or absence of heaviness in lower abdomen, bladder and bowel symptoms.

Uterine artery embolization (UAE)

Embolization is defined as the "therapeutic introduction of various substances into the circulation to occlude selective vessels, either to arrest or prevent haemorrhage, to devitalize a structure, tumour or organ."

It is one of the primary treatment methods for uterine fibroid. It is defined by occlusion of both uterine arteries supplying fibroid with using embolic substances which causes ischaemic necrosis of fibroid. It was initially used for management of obstetric and gynaecological haemorrhages.

In 1991, Ravina first performed uterine artery embolization pre-operatively to reduce the vascularity and size of fibroid.

Improvement of symptoms cancelled the definitive surgery in some cases. Heavy menstrual bleeding was reduced in 80 to 90% of the cases. Pressure symptoms reduced by 40 to 70% of the cases. Fibroid volume reduced by 50% at the end of 3 months. Hence this technique was used successfully in selective patients.

It must be performed in a specialized angiography unit by an experienced interventional radiologist. It was done best during postmenstrual period.

Prerequisites

1. Accurate pre-treatment diagnosis
2. No suspicious of malignancy as in sarcoma or endometrial carcinoma.
3. Patient should be warned of the possibility that the procedure may fail and hysterectomy may be needed later.
4. To get detailed informed written consent.
5. Pre procedural antibiotics to be given to avoid septicemia.
6. Preparation of parts.

Contraindications

Absolute contraindications

1. Pregnancy
2. Pelvic inflammatory disease
3. Pelvic malignancy.

Relative contraindications

1. Uterine size more than 20 -24 weeks
2. Coagulopathy
3. Renal impairment
4. Contrast allergy
5. Desire of future fertility
6. Subserosal or Submucosal fibroid –If embolization of pedunculated submucosal fibroid leads to expulsion of mass vaginally. Sometimes it leads to sepsis. If embolized to pedunculated subserosal fibroid as they can become infected leading to peritonitis.
7. Infertility
8. Large hydrosalpinx
9. Prior pelvic radiation

Table 1: Age distribution – study group

Age (Years)	No. of patients	Percentage
31-35	7	23.33%
36-40	15	50.00%
41-45	8	26.67%
Grand Total	30	100.00%

In this study, 30 -45 years of age group selected because most of women completed her family nearing thirty years now a days. Following table shows the age distribution of this study.

Table 2: Distribution of indications for uterine fibroid embolization

Indications	No. of patients	Percentage
Anemia	2	6.67%
Obesity	1	3.33%
Previous Surgery	3	10.00%
SHT	1	3.33%
Unfit	2	6.67%
Willing	21	70.00%
Grand Total	30	100.00%

Information about the procedure, advantages and disadvantages of this technique explained to the patients who were attending

Gynaecology outpatient department. 30 patients selected under inclusion criteria.

Among 30 patients, 21 patients opted uterine fibroid embolization. Remaining 9 patients were complicated cases. 2 patients had anaemia (to avoid need for blood transfusions, wound infections), 1 patient obese (to avoid complications like thromboembolism, impaired wound healing), 3 patients had multiple surgeries like caesarean section, appendectomy, correction of incisional hernia (to avoid bowel and bladder injury), 1 patient had systemic hypertension, 2 patients were unfit for surgery.

Hence these patients preferred uterine fibroid embolization than surgery. Following table shows distribution of indication for UFE.

Table 3: Distribution of symptoms of uterine myoma

Distribution of symptoms		
Symptoms	No. of patients	%
HMB	26	86.67
Dysmenorrhoea	20	66.67
Pressure Symptoms	4	13.33

Majority of patients complain of heavy menstrual bleeding, dysmenorrhoea and pressure symptoms. Among these heavy menstrual bleeding was the most common symptom. 26 patients (87%) presented with heavy menstrual bleeding, 20 patients

(67%) presented with dysmenorrhoea, 4 patients (13%) presented with pressure symptoms.

Following table shows distribution of symptoms:

Table 4: Heavy menstrual bleeding

Distribution of HMB by PBAC score	
PBAC score	No. of patients
<101	4
101-150	5
151-200	14
201-250	5
>251	2
Grand Total	30

In this study group, 26 patients had heavy menstrual bleeding. Pictorial blood loss assessment chart used to assess the blood loss during menstruation. Initially HIGHAM *et al*, was assessed the menstrual blood loss by pictorial blood loss assessment chart.

PBAC score of more than 100 indicates menorrhagia (heavy menstrual bleeding). In this study, 26 out of 30 patients had pictorial blood loss assessment score of more than 100. Average blood loss score in this study group was 172 and ranges from 40 -300

Distribution of pictorial blood loss assessment chart scoring given below

Table 5: Heavy menstrual bleeding on follow up after 4 to 6 weeks

Distribution of improvement in blood loss (4 to 6 weeks)		
Improvement in blood loss score	No. of Subjects	%
Worsening < 0	0	0.00
Remaining The Same 0-10%	4	13.33
Mild-10-30%	5	16.67
Moderate-30-50%	14	46.67
Good >=50%	7	23.33
Total Subjects	30	100.00

At 4-6 weeks follow up after the procedure, 21 patients (80%) had moderate to significant reduction of blood loss during menstruation. At 3month follow up study showed 24 patients (92%) had moderate to significant reduction of blood loss. Range of reduction in the blood loss score was 20- 80% at 3 and

6month follow up paired t test used to analyse p value for blood loss during menstruation at 3 month and 6 month was highly significant ($p<0.00001$).

Table showed reduction of blood loss on follow up given below

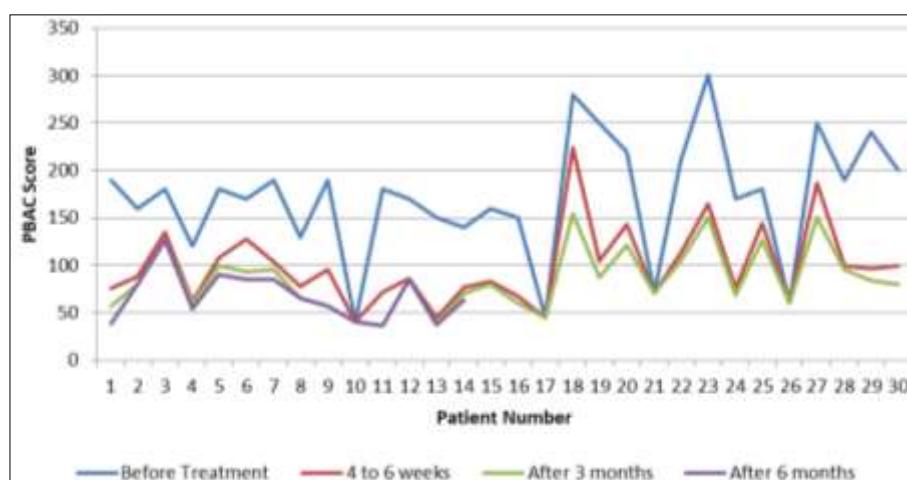


Fig 2: Comparison of blood loss score before and after treatment

Discussion

Leiomyoma is the most common benign tumour of uterus in the reproductive age group. It arises from smooth muscle cells in the myometrium of uterus. Its incidence varies from 20% - 25% but has been shown to be as high as 70%-80% in studies using sonography and histologic examination.

Uterine leiomyomas are estrogen and progesterone sensitive tumours. Many types of medical treatment available for treatment of symptomatic uterine leiomyoma but none of these are definitive treatment. Recurrence of myomas is more common if stopped these drugs. Traditional method of treatment for leiomyoma uterus was surgical management like hysterectomy.

Newer treatment modalities are uterine artery embolization, MRI guided ultrasound therapy, uterine artery occlusion through vaginal approach, endometrial ablation technique, etc. Among this uterine artery embolization technique is highly effective and minimally invasive procedure. It is the alternate primary treatment as compared to hysterectomy for uterine leiomyoma.

It is the recently evolving procedure worldwide. This method mainly preferred treatment modality for women who want to preserve the uterus and reproductive function. It is cost effective compared to hysterectomy for leiomyoma uterus.

In this study, 30 patients with symptomatic uterine leiomyoma selected under inclusion and exclusion criteria. Main objective of this study is to analyse the effectiveness, tolerability, complications of uterine artery embolization. Women who want to preserve the uterus for future pregnancy are excluded from this study.

Among 30 selected patients, 21 patients (70%) opted this procedure after explaining the technique. Remaining 9 patients (30%) had complications like anaemia, systemic hypertension, previous multiple surgeries, etc. 2 patients unfit for surgery were preferred for this technique to avoid surgical and anaesthetic complications.

Advantages of uterine artery embolization are

1. Simple technique
2. Minimally invasive
3. Safe compared to hysterectomy
4. Short hospital stay
5. No scar over the abdomen
6. No surgical and anaesthetic complication
7. Results of previous study were satisfactory.
8. Cost effective

Hence most of the patients preferred uterine artery embolization technique. It is considered as alternate primary treatment for uterine leiomyoma.

In this study, 30 -45 years of age group was selected because most of the women completed her family at nearing thirty years of age. Mean age of sample was 37 years. Above 40 years of age group selected for fractional curettage to rule out endometrial malignancy which is absolute contraindication for this procedure. After menopause fibroid mass regresses spontaneously because of reduction of hormonal (estrogen) levels.

Higham *et al* analysed the Pictorial blood loss assessment score of more than 100 was diagnosed as menorrhagia (heavy menstrual bleeding) which is equivalent to >80 ml of blood loss during menstruation. Average blood loss score during menstruation was 172 cu.cm. Range of blood loss score was 40 - 300 cu.cm.

In this study 20 patients (66.6%) had dysmenorrhoea. 3 patients

(10%) had mild dysmenorrhoea, 11 patients (36.6%) had moderate dysmenorrhoea, 6 patients (20%) had severe dysmenorrhoea.

Less number of patients had pressure symptoms in selected patients because size of myoma included in this study was less than 7 cm. 3 patients (10%) had increased frequency of micturition; one patient (3.3%) had lower abdominal heaviness. Alber J Smeet *et al* study reports showed more complications while selected symptomatic large fibroid uterus. Hence in this study selected the average size of fibroid up to 7cm x7cm.

Average volume of uterine leiomyoma was 119 cu.cm. Range of leiomyoma volume was 40 – 230 cu.cm.

We used unilateral femoral puncture and catheterization technique in all patients successfully. It was correlated with Pelage Jp and Soyer *et al* study in which Unilateral catheterization found to be safe and associated with fewer complications with experienced Intervention radiologist. There were no complications encountered in this study during the puncture. During catheterization one patient had vasospasm, hence unilateral embolization was done.

In this study, we used pre-operative antibiotics to reduce the pre-existing infections as well as postoperative infections following procedure. In this study no serious infective complications occurred.

In walker and pelage *et al* found 3 patients had infective complications leads to hysterectomy.

In Vashish *et al* reported one patient had septicaemia leads to death following uterine artery embolization.

There was vaginal expulsion of myoma seen in 2.5% of patients in the Walker and Pelage *et al* study. No such complications occurred in this study.

In this study one patient had technical difficulty like vasospasm leads to unilateral catheterization was done. All other patients had bilateral catheterization successfully. In Pelage *et al* found successful bilateral catheterization done in 92% of patients.

Katz *et al* study showed gel foam and polyvinyl alcohol particles used as embolic agent. Both are equally effective for uterine artery embolization. Hence in our study gelfoam used as embolic agent.

Average duration of procedure in this study was 77 minutes. And range was 46 – 108 minutes. It is comparable to previous studies. In this study, intermittent fluoroscopy was used to reduce the radiation exposure. Average radiation exposure time was 40 minutes. It was higher than previous studies.

Post-procedure events like pain fever and vomiting occurred in this study and 28 patients (93.3%) had pain, 6 patients (20%) had fever, 10 patients had (33%) vomiting. All patients managed with analgesics and antiemetics. NSAID's used for pain in parenteral or epidural route according to severity.

After the procedure patient immobilized her lower limb in which side operated for 24 hours in this study. After that patient was ambulated and discharged at 2-4 days.

In Giovanna Tropeano *et al*, reported shorter hospital stay (1 – 2 days) for uterine artery embolization compared to hysterectomy (5.8 days). In our study, Average duration of hospital stay was 2.8 days and range was 2 – 5 days.

During follow up patients were attended the gynaecology outpatient department where detailed menstrual history collected and analysed at 4-6 weeks, 3months and at end of 6months.

Ravina and Goodwin *et al*, studied uterine fibroid embolization in symptomatic uterine leiomyoma patients. Reports showed improvement of menorrhagia was seen in 81% of patients. In this study, at 4-6 weeks 80% of patients had improvement in menorrhagia. At 3 and 6 month, follow up showed 92% of

patients ($p<0.00001$) showed improvement in menorrhagia. None of patient had worsening of menorrhagia. Reduction of heavy menstrual bleeding in this study was highly significant compared to previous study. None of the patient had transient amenorrhoea in this study.

82% of patients had moderate to significant improvement of dysmenorrhoea at 4-6 weeks and at 3 months 88% of patients had improvement of dysmenorrhoea which was highly significant compared to previous studies. None of the patients had severe dysmenorrhoea at end of 3 months follow up. In Mahmood *et al* study showed 74% of patients had improved dysmenorrhoea. At end of 3 month all 4 patients had improvement of pressure symptoms.

Spies *et al* showed 50% reduction of volume of myoma at 6 months. In our study there was 35% and 41% reduction of myoma volume observed which was comparable to previous study.

Conclusion

From this study we have concluded that uterine fibroid embolization found to be an effective, safe and alternate primary treatment to hysterectomy to reduction of symptoms in uterine myoma. On short term follow up, less failure rates observed in this study.

Many advantages of procedure like no anaesthetic and surgical complications, no scar, no need for blood transfusions, satisfactory reduction of symptoms and size of uterine myoma, short recovery and hospital stay was observed in this study. Unilateral femoral puncture technique was used with expert interventional radiologist. Gelfoam used as embolic agent which was equally efficacious compared with polyvinyl alcohol particles.

Some studies not supported in future fertility after uterine fibroid embolization. Some studies reported pregnancy complications like spontaneous abortion, preterm delivery, etc. hence in this study group selected after completing the family.

It replaces the major invasive surgeries like hysterectomy and myomectomy. Hence it is safe, highly effective, minimally invasive and alternate primary treatment in management of symptomatic uterine leiomyomas.

In this study there was less failure rate on follow up.

Limitations of the study

- Smaller sample selected
- Follow up was only for short term

References

1. Marshall LM, Spiegelman D, Barbieri *et al*. Variation in the incidence of uterine leiomyoma Camoung premenopausal woman by age and race. *Obstetgynecol* 1997;94:967-973.
2. Day Baird D, Dunson DB, Hill MC *et al*. Incidence of leiomyoma: ultrasound evidence. *Am J Obstetgynecol* 2003;188:100-107.
3. Matchar DB, Myers ER, Barber MW *et al*. Management of uterine fibroids. AHRQ Publication No. 01-E052. Rockville, MD: Agency for Healthcare Research and Quality 2001.
4. Sankaran S, Manyonda I. Medical management of fibroids. Best Practice & Research Clinical Obstetrics & Gynaecology 2008.
5. Chiaffarino F, parazzini F, La vecchia C *et al*. Oral contraceptives and uterine fibroids: results from a case control study. *Br J Obstet Gynaecol* 1999;106(8):857.
6. Kailasam C, Cahill D. Review of the safety, efficacy and patient acceptability of the levonorgestrel-releasing intrauterine system. Patient preference and adherence 2008;2:293-302.
7. Crosignani PG, Vercellini P, Meschia M *et al*. GnRH agonist before surgery for uterine leiomyomas. A review *JReprod Med* 1996;41(6):415.
8. Carbonell Esteve JL, Acosta R, Heredia B, Pérez Y, Castañeda MC, Hernández AV. Mifepristone for the treatment of uterine leiomyomas. *Obstet Gynecol* 2008;112:1029-36.
9. De LeoV, La marca A, Morgante G. Short term treatment of Uterine fibre myomas with Danazol. *Gynaecolobstet invest* 1999;47(4):258.
10. Wilkens J, Chwalisz K, Han C *et al*. Effects of the selective progesterone receptor modulator asoprisnil on uterine artery blood flow, ovarian activity, and clinical symptoms in patients with uterine leiomyoma scheduled for hysterectomy. *J Clin Endocrinol Metab* 2008;93:4664-71.
11. Soriano D *et al*. Pregnancy outcome after laparoscopic and laparoconverted myomectomy. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 2003;108:194-198.
12. Agdi M, Tulandi T. Endoscopic management of uterine fibroids. *Best Practice & Research Clinical Obstetrics & Gynecology*, online publication 2008.
13. Goldfarb HA. Myoma coagulation (myolysis). *Obstet Gynecol Clin North Am* 2000;27:421-30.
14. Ringold S. FDA approves ultrasound fibroid therapy. *JAMA* 2004;292:2826.
15. Ravina JH, Herbretean D, Ciraru-Vigneror N *et al*. Arterial embolisation to treat uterine myomata. *Lancet* 1995;346: 671-72.
16. Liu WM, Ng HT, Wu YC, Yen YK, Yuan CC. Laparoscopic bipolar coagulation of uterine vessels: a new method for treating symptomatic fibroids. *Fertility and sterility* 2001;75(2):417-22.
17. Akinola OI, Fabamwo AO, Ottun AT, Akinniyi OA. Uterine artery ligation for management of uterine fibroids. *International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics* 2005;91(2):137-40.
18. Robert I, White MD. Interventional Radiology: Reflections and Expectations. *Radiology* 1987;162:593-600.