UNIVERSITY OF MEDICINE AND PHARMACY CRAIOVA
UNIVERSITY OF MEDICINE

DOCTORAL DISSERTATION

Summary

POST EMBOLIZATION EVALUATION OF UTERINE FIBROMAS

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INTRODUCTION

The leiomyofibroma represents the most common benign tumour occuring in humans. Uterine fibromatosis has an increased frequency in fertile women, having a negative influence over the quality of life and fertility. Treating a patient with an uterine fibroma must take into consideration both the patient's unique characteristics but also the character of the pathological process.

Ten years after Ravina et al. introduced the embolization concept as a curative maneuver for uterine fibromatosis, UFE has been accepted as a safe alternative for the surgical treatment of fibromas. [5, 116] The present paper aims to present the embolizing technique used in the Universitary Centre of Craiova, underlining the advantages deriving from this type of treatment in comparison with the classical surgical approach for patients sufering from uterine fibromas.

GENERAL CONSIDERATIONS

CHAPTER I

Anatomical landmarks

I.1.The uterus

The uterus is a pelvic organ with a muscular cavitary structure, ressembling a cone's base, skewed in an anterio-posterior manner, having its base upwards and tip oriented downwards. It has a uterine body, neck and cervix.

The uterine orientation varies with the woman's position and also with the plenitude state of the surrounding viscerae. Between the body and the cervix there's a flexion angle which physiologically has a value of 140-170 degrees.

I.2. The pelvine blood vessels

Terminal aortic branches:

The common iliac artery *(A. iliaca communis)*, left and right, originate from the aortic bifurcation, ending by its dihotomisation in the two termina branches: the external iliac artery and the internal iliac artery.

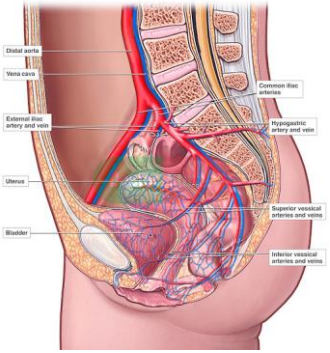
The artery has a variable length, between 4 and 7 centimeters; the right common iliac artery is slightly longer and less thick than the left one.

The genital blood vessels are found externally to the common iliac arteries and they never intertwine. The ureter intersects the anterior aspect of the left common iliac artery, 1 centimeter above the bifurcation, as far for the right side, it intersects the bifurcation aproximately one centimeter below said bifurcation (Luschka's law).

The internal iliac artery(hypogastric) (*A. iliaca interna)* is a branch of the common iliac artery and has a 4 centimeter trajectory towards the posterior. The ureters, fimbriae and the fallopian tubes are found anterior to the internal iliac arteries. The internal iliac artery supplies blood flow to pelvine viscerae, the external genitalia and the postero-medial region of the thigh.

The uterine artery(A uterina) represents an artery whose aspect, length and diameter vary in conjunction with the woman's physiological status.[147] From its origin, it descends on the pelvic wall until it reaches the broad ligament, afterwards has a lateral to medial transverse trajectory, through the pelvic base, reaching the superovaginal cervical segment's lateral margin. In this area it crosses anteriorly and superiorly the ureter.

Moreover, there have been cases of rare anatomical variants, such as the double uterine artery on one or both sides, or their absence.



The branches for the uterine body*(Rr. helicini)* have a tortuous trajectory, which enables them to adapt to the volume increase associated with gravidity.

The arcuate arteries branch over into peripherial branches that irigate the external third of the myometrium, and radial branches distributed centripetally towards the endometrium. The radial branches have a corkscrew trajectory towards the myometrium, anastomosing with each other into the plexiform layer, a rich arterial structure.

The point of origin of the uterine artery has an increased variability, correct evaluation of its origin point being able to avoid catheterization failure.[136]

CHAPTER II
UTERINE FIBROMA PATHOLOGY

The uterine fibroma represents the most common benign tumour occuring in humans. It also represents the most common uterine tumour developed from the smooth muscular tissue residing in the uterine wall (myoma), however presenting a conjunctive component, thus defining it as fibromyoma.

II.2. Incidence

Uterine fibromas are considered three times more frequent in the black rase[221], probably due to a genetic predisposition or particular socio-economical conditions.

Generally uterine fibromas can occur at a younger age, but they usually are asymptomatic until 30-40 years of age or more. In the speciality literature there were cases of discovered uterine fibromas such as a chistic form at a 13 years of age described by Wisot et al(1969) and a mutiple fibroids presentation at a nine year old girl by Saraki.[205]

II.3. Etiopathogenesis

There are a series of theories, each having compelling arguments, some more credible than others: the hereditary congenital theory of Conheim, the vascular theory of Klebs-Pillot, the infectious theory of Wirchoff and the hormonal theory.[205]

At the present time the tumoural nature of the uterine fibroma is unanimously accepted, while its pathogenesis keeps raising two problems: What is the origin of the fibroma generating cells and what triggers the proliferative process?[128]

HORMONAL GENERAL FACTORS

The estrogens' role in the etiopathogenesis of the fibroma was early suspected. In 1933, Witherspoon hypothesises the hyperfoliculinemic theory, stating that there is a causal link between ovarian chists with increased estrogen secretion and endometrial hyperplasia, usually asociated with uterine leiomyomata.

The presence of excess estrogen at an uterine level is also supported by Deligdish and Lowenthal's observations. Moreover, recent studies state the presence of endometrial hyperplasia mostly in the perpherial areas of submucous fibromyomatous nodules.

The complex process of uterine fibroma histogenesis can be ilustrated in a few steps.

a. **Formation of proliferation centres**

b. **Initiation of microscopic modifications**

c. **Tumour development**

In case the hyperhormonal status persists over a set period of time, the first element influenced is the blood vessel.[22] Among the local vascular changes, the congestion of the periuterine venous plexus is widely observed intra-operatory while performing histerectomies.

II.4. Morphopathology

The uterine fibroma is described as an unique or multiple tumoural mass, of variable dimensions. It is also easy to delimitate from normal myometrial tissue, largely due to its hypertrophic and deforming aspects.

Uterine body localization is by far the most frequent (aprox 96% of cases), the tumour residing either in the anterior wall, either in the posterior one.

The cervical position of the fibroma is extremely rare (0,5—2,5%) and they usually coexist with fibromyomas located in the uterine body's walls. They can be located above the vagina or intra-vaginal.

Subperitoneal fibromas can be sessile, thus deforming more or less the uterus' contour, or pediculate, the risk being tosion or rupture. Pediculate tumours can receive blood flow from epiploic adherences, the complete uterine detachment along with tumour relocating intraperitoneally being a possibility.

Hystological types of fibrommyoma are being represented by:

a**.** THE TIPICAL LEIOMYOMA - It is composed by cells ressembling the myometrial cell, the only differences being that: the myomatous cell is larger (45 – 480 μm), its citoplasm is homogenic, with fewer myofibrils and also the nuclei appear intensely coloured, fusiform, with a thick membrane and usually presenting 2-3 nucleoli.

b. THE CELLULAR LEIOMYOMA - represents a particular variety of myoma, defined by its dominance of smooth muscular cells, the connective tissue being almost absent. The myomatous cells are being arranged in a organised pattern, ressembling the cells found in typical leiomyoma.

c. RARE TYPES OF LEIOMYOMA – Here we can mention the uterine fibromyolipoma, the hypervascular leiomyoma (angioma) and the pseudosarcomatous leiomyomas.

CHAPTER III

SYMPTOMATOLOGY

The tumour is often identified during general surgery or as a clinical examination finding. In other cases, in spite of the small size of the tumour, the symptomatology is well defined, being characterised by genital bleeding, pelvine pains and even complications that put the patient's life at risk.

III.1. The asymptomatic fibromyoma

A series of fibromyomas remain well tolerated and stable throughout the woman's entire fertile life, while at the menopause they slowly regress. In these cases, the menopause represents the cure for that particular fibroma.

III.2. Uterine hemorrhages

Uterine hemorrhages present themselves in varied forms. They appear suddenly, being preceded and followed by regular menstrual cycles or they appear slowly (more frequently) worsening as time goes by, consequent every menstrual cycle.[23, 108]

Menstrual hemorrhages never appear in a sudden manner; the menstruations are being progresively more abundant, over 80 ml, frequently containing clots. The duration in more than a week, streching towards 10-12 days, ending with the emission of a pinkish serum.[155]

Metrorrhagias are far less frequent (13% of cases), after Huguer. They appear in between menstrual cycles, in a discontinuous manner, being suggestive for a submucous myoma or for a fibrous polyp.

III.3 Hidrorrhea, pyorrhea

Hidrorrhea can be classically considered a valuable semiological sign for a intracavitary fibrous polyp or for a submucous myomatous nodule. It is rare (1.8 % of cases). Pyorrhea or hidrorrhea can also indicate the presence of a uterine body cancer.

III.4. The painful fibromyomas

The pain is being produced by the degeneration of tissue following circulatory distress, infections, the torsion of a pediculate tumour, compressive effect on the pelvic structures or associated lesions.[60]

The pain can be continuous or paroxystic, depending on the determining cause.

The patient indicates a pelvine discomfort or even lombo-abdominal pains, starting during the menstruation and persisting in the first two or three days of the menstrual cycle. Moreover the pain is accompanied by a small menstrual blood output. Shortly after, the menstrual hemorrhage intensifies in a sudden manner, relieveing the menstrual pain. This is the „uterine syndrome" described by Faure.

III.5. Compression on adjacent structures

The involvement of the ureters can result in a simple ureteropielocaliceal dilation or, in more severe cases, advanced hydronephrosis and even renal insufficiency.

The colorectal compression syndrome is being characterised by fake defecation sensation, chronic constipation or mechanical occlusion of the bowel.

In spite of the fact that vascular occlusions are exceptionally rare, venous compression can cause lower limb edema and thrombophlebitis.[16] The association of this condition with a patent infection in the pelvis and hypercoagulability may create an environment for spontaneous phlebitis.

CHAPTER IV
DIAGNOSTIC

In the case of uterine fibromas, it consists of:

- diagnosis confirmation, obtained by performing a gynecological exam, pelvic echography or MRI
- targeting the tumour location: intramural, subserous, submucous
- differential diagnosis with endometrial hyperplasia or ovarian tumours
- infirmation of malignancy, obtained by Babeş-Papanicolau testing, endometrial biopsy, HSG, hysteroscopy with diagnostic biopsy.

MEDICAL IMAGING INVESTIGATIONS

IV.2.1 THE ECHOGRAPHIC EXAMINATION

Not only the echography offers a certain diagnostic, but it can also supress the need for damaging investigations like radiologic explorations or celioscopy that are expensive and harder to accept by the patient.[36]

The echographic examination has an important role in the investigation plan for diagnosing uterine fibromas, being a cheap and noninvasive method. However it does not diminish the role of the clinical examination.

The transabdominal echography - it is important for describing large fibromas.

Transvaginal echography - it is necessary for intraparietal fibromas and also for small and medium submucous fibromas. More uses are the identification of the gestational sac, ovary and endometrial thickness visualisation.

Doppler/Power echography - Allows tissue vascularisation cuantification.

IV.2.2. COMPUTERISED TOMOGRAPHY

It is exceptionally usefull in the primary diagnostic of pelvic tumours, especially when the patient is obese or has surgical scars that hinder the echographic approach.[103]

Computerised tomography is frequently used for the diagnosis of primitive uterine tumours, accounting for:

a. tumoural staging (especially stages III, IV)
b. accounting tumoural extension
c. excellent visualisation of uterine fibromatosis associated calcifications.

IV.2.3. MRI EXAMINATION

It offers high image accuracy, representing an investigation that can easily replace CT or echography. [32, 33]

Not only the MRI examination offers the option of a post-procedure comparison[47], but also it can safely exclude adenomyosis and stage I endometrial carcinomas.[52]

CHAPTER V
TREATMENT

In the therapeutic conduct for the uterine fibromyoma we must keep in mind a series of characteristics regarding the disease and its evolution: it represents a benigne tumour, with maximum incidence in patients with ages between 40-50 years old, that spontaneusly involves after the menopause. Complications don't necessarely appear and malignancy degeneration is extremely rare.

V. 1. Surgical treatment

It reunites the surgical techniques afferent to the myomectomy, myometrectomy, hysterectomy, myolysis, cryomyolysis and lastly HIFU (high intensity focused ultrasound).

This type of treatment involves a series of risks and complications, represented by general anesthesia, febrile status post-histerectomy (15-38% of cases, according to some occidental studies), long recovery time, social reinsertion after up to six weeks, sexual function decline and psychological manifestations.

V.2. Medical treatment

Considering the functional character of most of the fibromyomatous hemorrhages, and also the correlation between its evolution and excess estrogens, the basis for the medical treatment is represented by hormonal therapy with progestatives and GnRH agonists.

V.4. The endovascular treatment by embolizing the uterine arteries

This type of treatment represents the completion of the pelvine angiography with a therapeutic maneuver. The initial use for the technique of UFE served as a pre-operative maneuver preceding programmed myomectomies for symptomatic uterine fibromas. Its use was to limit bloodloss in the operating room. The reduction of symptoms in patients with uterine fibromas led to a series of patients refusing the surgical intervention. Later on UFE started evaluation as a stand-alone therapy.

Uterine artery embolization(UAE)

This technique allows for the transcutaneous introduction of a catheter into an artery or vein (most commonly approached are the femoural vein and artery[41, 160] located in Scarpa's triangle and more difficult to approach in the humeral artery).

The arterial approach is made at elbow level (brachial artery), using a COBRA II catheter with a minimal length of 100-110 cm and 4F diameter. The catheter is guided through the subclavian artery, descending aorta, common iliac artery, internal iliac artery, in order to selectively approach the uterine arteries.

Firstly a diagnostic arteriography is realised, allowing the study of the uterine artery emerging point.

Embolizing particles are being inserted, usually through a 3 way stop-cock to which a seringe is attached. The contents of the seringe are usually contrast media (1 ml or 3 ml) mixed with embolizing particles. The other seringe contains only contrast media. The other end of the stop-cock is connected to the catheter.

Following examination, after catheter retraction (without a guidewire present into the catheter - maneuver used to avoid the dislodgeing of a potential embolus), the artery is being compressed for at least 10 minutes for haemostatic purposes.[167]

PART II
PERSONAL RESEARCH
CHAPTER I
POURPOSE, OBJECTIVES AND THESIS MOTIVATION

The aim of this thesis is the presentation of the stages for the uterine artery embolisation curative treatment for uterine leiomyomata.We will insist on method costs, the patient type towards whom this type of treatment is adressed and also the method's advantages in comparison with the surgical and non-surgical approaches.

- Applying the therapeutic method of uterine artery embolization for symptomatic fibromyomatous uterine tumours.
- isolating unique vascularisation aspects regarding normal myometrial tissue and more important tumoural tissue, during the diagnostic angiography stage.
- comparing the brachial artery vascular approach technique used in this particular study with literature data, obtained by femoural arterial approaches.
- the post-embolization syndrome control, especially that characterising post-interventional pain.
- evaluation of patient evolution with imaging tools for the first 6 monts post-intervention.

CHAPTER II
MATERIAL AND METHOD

The study group is comprised of 193 patients, with ages between 20 and 46 years old, in whom one or more fibromatous uterine nodules have been identified. The study took place during the interval April 2011 – September 2013 in the Interventional Radiology Department of the Emergency Clinical County Hospital of Craiova, in colaboration with the Gynecology I Clinic of Craiova and the Interventional Radiology Department of the Universitary Emergency Hospital Bucharest.

II.3. Embolizing technique employed

The method's principle consists in selectively catheterising the uterine arteries bilaterally and introducing embolizing particles in order to cause arterial thrombosis.

II.3.2. Embolizing stages:

A. Vascular approach

It is accomplished with the Seldinger technique of mounting an arterial brachial line. We used arterial sheaths of 4F or 5F.

B. Selective arterial catheterization

It is obtained by introducing the catheter into the desired arterial area, according to the protocol mentioned before.

C. Verifying correct catheterization

It is conducted for each uterine artery, injecting contrast media trans-catheter, while following the aquisition of images. The quantity and flow-rate for the injection depend on the arterial diameter and the fibroma's overall volume.

D. Embolizing particles injection

In order to complete a succesfull therapeutic embolization of the uterine arteries, the trans-catheter injection of embolizing particles is necessary.

E. Embolization control

It is conducted with test-injections of contrast media in order to control the embolization status.

F. Post-interventional hemostasis

After the correct embolization, the catheter has been retracted, followed by the arterial sheath. Hemostasis is obtained with prolonged bimanual compression (5-10 minutes) and afterwards the puncture site is corectly dressed. Bed rest is recommended for at least 3-4 hours.

II.4. Post-interventional follow-up

After the angiographic maneuvers are finalised, the close monitoring of the patient's status is vital, in order to be able to isolate any complications that may occur.

We considered relevant the separation of the post-intervention period into two intervals, each with specific observed parameters, in order to obtain the best patient monitoring possible.

- early phase(first 72 hours) – it is realised while the patient is addmited.
- late phase(until the 6 months mark)- the patient is examined in a series of appointments(with the patient's permission it can be prolonged to several years)

CHAPTER III
REZULTS

III.1 Studied group characteristics

In the present study we made 193 uterine fibroma embolizations for uterine fibromyomatosis in patients with ages between 20 and 46 years.

III.2. Uterine lesions characteristics

Another patient classification in the studied group can be obtained by assesing the number of fibromatous nodules identified during the imagistic exams.

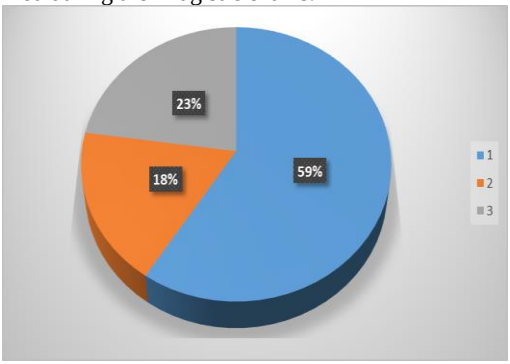


Fig. 1. The distribution of fibromatous lesions in the studied group 1-one lesion; 2-two lesions; 3-more than two lesions

An important role in selecting the patients for this type of minimally invasive intervention was the location of the fibromas, most of them reziding intramuraly or subendometrialy:

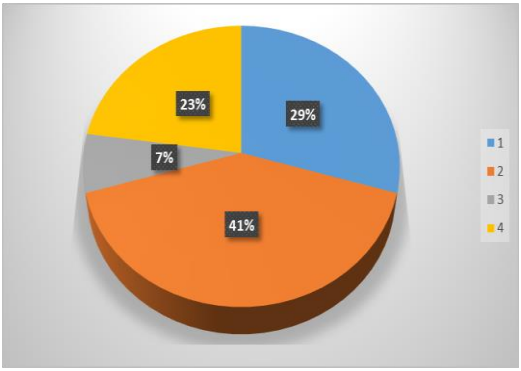


Fig. 2. Fibromatous nodules distribution in the studied group: 1-subendometrial; 2- intramural; 3 – subserous; 4 – multiple locations

From data obtained from these imaging investigations we can conclude the following: the dimensional regression of the fibromatous nodules at the six months interval shows that:

- Volumetric regression between 0 – 25% was isolated in 127 cases;
- in 45 cases the volume regression was contained between 25-50%;
- 17 of the patients had more than 50% tumour volume decrease at 6 months;
- in four patients the myomatous nodules were undetectable with imaging tools.

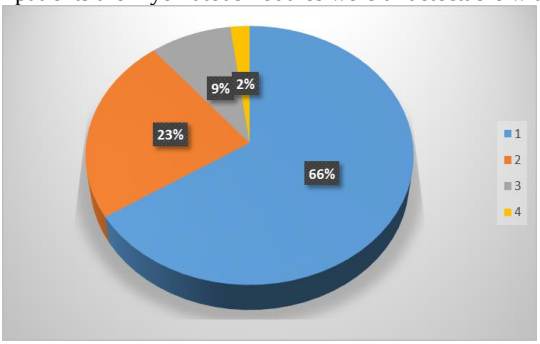


Fig. 3. Volumetric regression of fibromatous lesions 6 months after the intervention: 1- under 25 %; 2- 25-50% regression; 3 – over 50% regression rate; 4 – nodule expulsion;

III.3. Uterine artery origin points – practical relevance

The uterine arteries' origin is highly variable between patients, having significant practical importance in applying the embolizing therapy. Correct identification of the uterine artery origin can prevent catheterization failure and also reduce radiation dose and intervention duration.

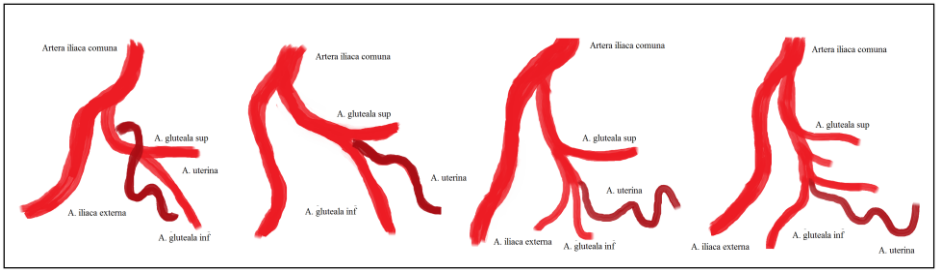


Fig. 4. Uterine artery points of origin – schema

III.4. Case presentations:

In the following pages I will present a series of significant cases, relevant for the study group.

The first case is a patient of 28 years of age, presenting at the gynecological examinantion for menstrual abundant hemorrhages, over prolonged periods of time (approximately 6 days), shortly followed by a brownish secretion. She also presented with clots and a pelvic discomfort symptomatology. Moreover the patient has been suffering for primary sterility for 5 years.

The echographic examination identifies a fibromatous nodule of approximately 52/39 mm, with a paracavitary position, deforming the endometrial surface and bulging into the uterine cavity, with no other tubar or ovarian abnormality identifiable echographically.

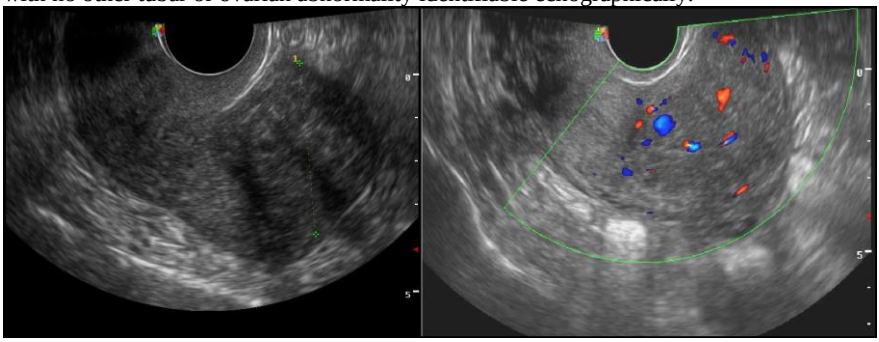


Fig 5. Subendometrial large fibromyoma(1) Present bloodflow inside the fibromyoma(2)

After consulting with the gynecologist the patient agrees to the intervention and enrolls for uterine fibroma embolization.

Keeping in mind the moderate fibroma vascularization identified echographically, we used Embospheres of 300-500µm (Biosphere Medical, Rockland, MA, USA) in quantity of about 2 ml. Moreover we employed Gelaspon (Gelita Medical, Amsterdam, THE NETHERLANDS) particles, mechanically processed into small fragments.

The steps of the embolization process were brachial artery vascular approach, the catheter passage through the descending aorta, iliac arteries and finally selective catheterization of the uterine arteries.

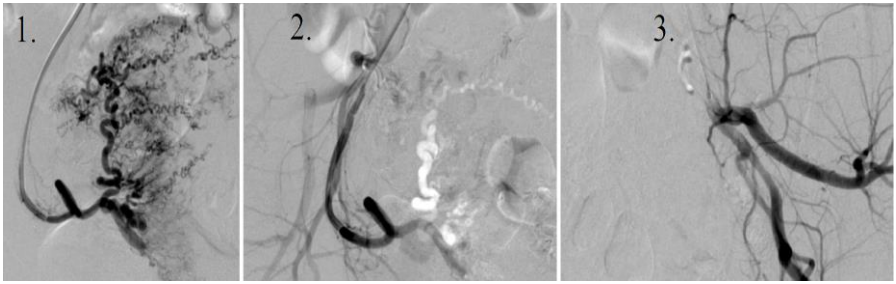


Fig. 5. Injecting the right uterine artery- vascularization of uterus and fibromyomatous nodule vessels (1); Angiographic image during embolization- absence of opacifiation of uterine artery (2); Embolizing the left uterine artery(3)

The post-embolization syndrome started to manifest with intense pain, in response to that we administered Perfalgan 1fl/6hr, Tramadol 1 vial iv/6hr and two vials of Mialgin intramuscular (first in the first hour, the second after 8 hr).

We administered Ampicilina 500 mg/6hr intravenoulsy for 3 days as profilaxis, followed by another two days orally. The post-embolization syndrome symptomatology ceased for the most part after the first 48 hours, afterwards the patient being discharged from the hospital.

At the one month mark echographic investigation, we discovered the tumour size reduction to approximately 47/35 mm, along with the absence of Doppler signal inside the nodule.

In the same investigation we concluded that the rest of the myometrium was presenting normal blood flow. Moreover, blood flow in the uterine artery normal velocitometric markers.

The patient relates that her menstrual cycles have normalised quantitywise and timewise.

Three months after the embolization, the echographic exam shows a nodule with reduced diameter of up to 42 mm, with no intratumoural blood flow. The endometrium presents normal structure.

Six months after the intervention, the patient shows signs of pregnancy, while the clinical and echographic examinations indicate a 3-4 week old pregnancy.

The next echography appointments show normal pregnancy parameters until the 26 week marker (the last echographic exam). There were no signs of ICIU.

During those examinations there was observed a tumour increase in size or revascularization of the fibromatous nodule.

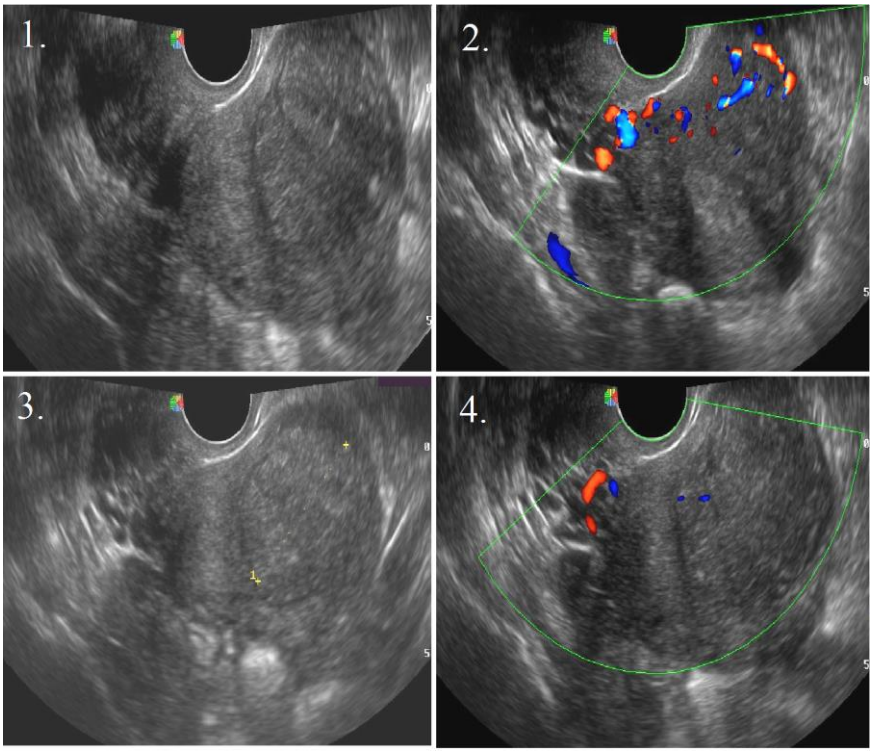


Fig. 6. Echographic examination at one month after the intervention; discrete reduction in size(1)Lack of Doppler signal inside the nodule; normal blood flow in the myometrium(2) Three months echographical exam- dimensional reduction of the fibroma(3); 6 months endovaginal echography – absence of Doppler signal inside the fibroma(4)

The next case belongs to a patient of 39 years of age, presenting with typical symptoms: prolonged menstrual bleeding, pelvic discomfort, pelvic pains, presence of blood clots, and episodes of metrorrhagia. The patient was subjected to an echographic examination, along with a gynecological exam, leading the diagnosis of polifibromatous uterine disease.

At the following echography appointments, we identified a slight increase in the parietal nodules' sizes along with a moderate vascularization of the same nodules. At the last examination two heterogenous hypoechogenous nodules were identified (30 mm and 20 mm in diameters).

Doppler sonography showed low resistance arterial flow inside the nodules. The uterine arteries also presented low resistance blood flow.

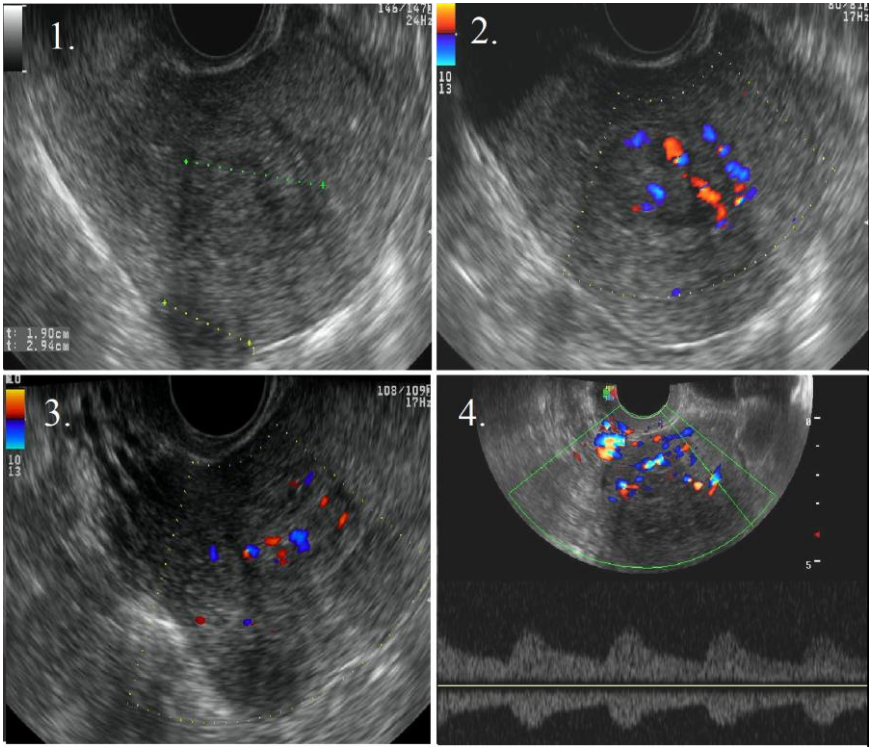


Fig. 7. Hyperechogenic nodular images paracavitary and subserous – endovaginal examination(1)Doppler signal increased inside the nodule(2) Myometrial vascularization of normal aspect(3) Low resistance blood flow in the arcuate arteries(4)

When presented with the therapeutic options, the patient opted for the embolization.

We must mention that a large section of out patients informed themselves over the internet. In the majority of cases, the gynecologist did not present this treatment option.

After routine investigations have been completed, we diagnosed a slight case of anemia (Hb = 11.3 %), with renal and clotting tests normal.

After brachial artery succesful puncture and sheath introduction we proceeded to selectively catheterize the uterine arteries, afterwards we went on to embolizing each artery with definitive embolizing particles and resorbable particles in the same technique as before.

We also administered pre-interventionally analgetic medication (Tramadol – 1 vial - iv), antibiotic therapy (Ampicilina 500 mg iv) and during the interventional maneuvers, we diluted along with the embolizing particles 2 ml of Xilina 1% in each uterine artery.

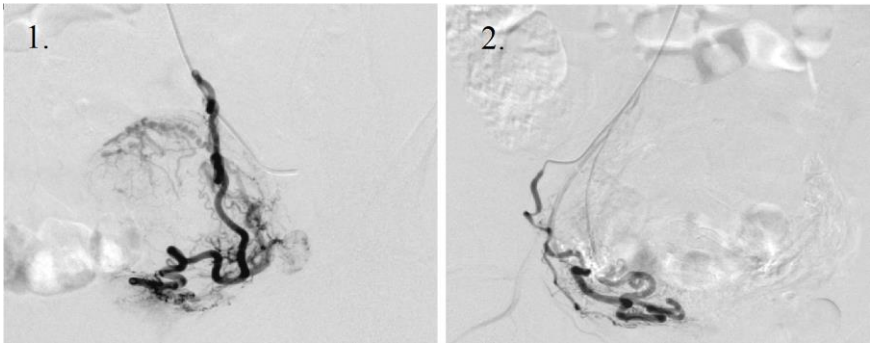


Fig. 8 . Catheterization control for the left uterine artery- visualization of the arcuate arteries(1)
Verifying correct embolization – low flow-rate contrast media injection(2);

The post-embolization syndrome had as its primary symptom the pelvic pain. The pain had moderate intensity and presented imediatly after the completion of the intervention. In reaction to the patient status we administered Tramadol 1 vial/6hr, Mialgin 1 vial intramuscular one hour after the procedure ended and Perfalgan 1 vial/6hr iv.

The patient also presented with nausea; in order to counteract the symptom we gave her Metoclopramid 1 vial in a slow iv drip.

The febrile syndrome specific to the early stage after the embolization had both reduced duration and intensity (approximately 10 hours, values not higher than 37.6 ºC), and were counteracted with antipiretics. The patient was discharged 48 hours after the intervention, with a good overall status, still having a small secretion of degraded blood.

At the one month echographic examination we found a discreet decrease in the fibromatous formations' size, along with the lack of Doppler signal intranodular.

Three months post-embolization we disclosed the formations' dimensional reduction, a normal looking uterine structure and also the patient reports that she had two normal menstrual cycles with no menorrhagia episodes whatsoever.

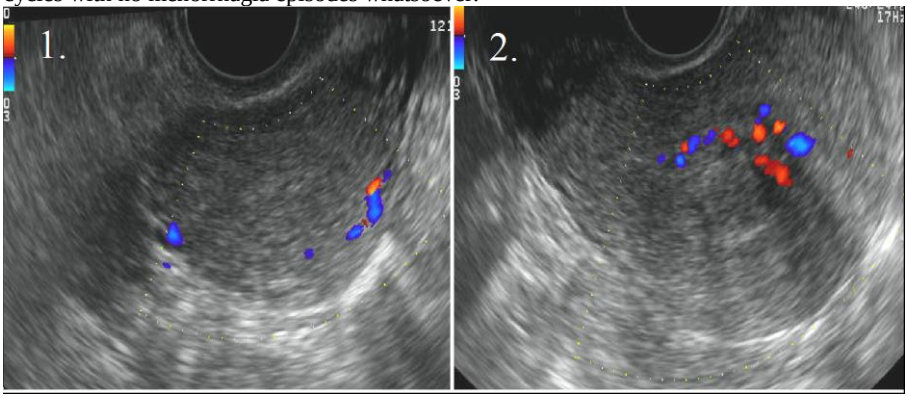


Fig 9. Discrete dimensional reduction of the nodules.No Doppler signal inside the nodule(1); Vascularization present 3 months after the embolization(2)

The six months examination shows results comparative with the anterior appointment.

One of the causes for failure or partial failure of the embolizing procedure is represented by the atypical origin of the uterine artery. From our study group we only had one patient that was embolized only unilaterally.

CHAPTER IV
DISCUTIONS

IV.1. Particularities regarding technique in this particular study

The treatment technique for this study group is based on the guidelines cited by a series of foreign authors. Moreover, we contributed with a less utilised arterial approach method that enables for an easier catheter navigation and also accounts for increased comfort for the patient, especially in the early post-embolization stage.

Flouroscopy time

Regarding the selective catheterization of the uterine arteries, and the introduction of the embolizing materials, the fluoroscopy times varied between 4.5 minutes and 32 minutes.

Evaluating radiation doses

One of the major inconvenients of this type of therapy is represented by the large radiation dose absorbed by the patient during this intervention.

In spite of the fact that this procedure has been used for a few years now, with more and more centres adopting this method, large randomised studies have yet to appear.

Table 1

Medium X-ray doses absorbed by the patient in different radiological procedures

	Pulmonary X-ray	**Barium stomach examination**	**Ct abdomen**	**UAE**
Mean dose	68µGy	215mGy	78mGy	927mGy

IV.2. Optimised control over the post-embolization syndrome

The post-embolization syndrome is being generally manifested in all patients subjected to this type of procedure. The main complaint in the post-embolization syndrome is pain, however pain intensity varies widely from patient to patient, ranging from „bearable" to colicative pains, thus needing a energetic and potent analgetic treatment.

Sometimes, the pain management needs to begin before the procedure is even started.

Hospitalization time

One of the most important factors that state the value of this type of intervention is represented by the reduced hospitalization period. Moreover the recovery and social reintegration period are far shorter.

Foreign authors state in a series of statistical papers that patient admissions vary from 0.81 to 2.2 days, afterwards the patients are being followed on a out-patient basis.

In comparison with literature data, in the present study group the admission period was kept between 48 and 72 hours, with a mean value of 2.8 days admission time, largely due to the need to fight off any of the early complications.

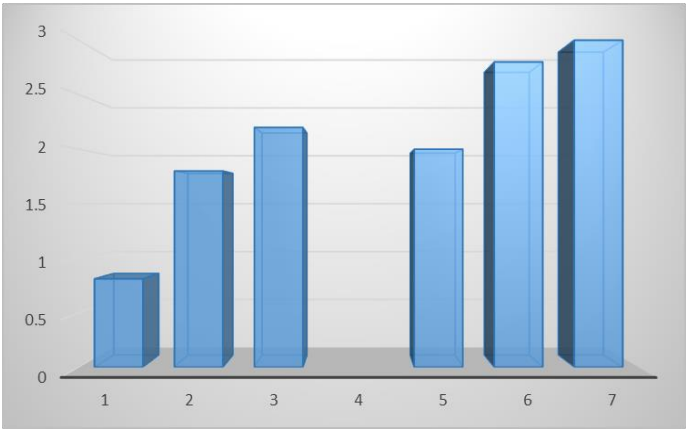


Fig 10. Minimal, mean and maximum admission time for patients in literature compared with our study group

IV.3. Clinical and imagistic monitorization after embolization

Following post-interventional evolution is easily realised with the aid of the echographic examination. It is preferred to respect a strict follow-up protocol concerning clinical and imagistic evolution of the uterus and the fibromyomas, being comprised of the following steps:

-A gynecological clinical examination at 10-15 days after the intervention, in order to detect any late complications determined by the embolization maneuver.

-A series of echography appointments, completed with endovaginal investigation and pulsed Doppler investigation aimed at the uterine blood flow, the myofibroma lack of blood flow, and the myofibroma involution rate. These appointments should be set at one, three and six months after the procedure.

IV.4. The importance of the therapeutic method

What is the place for uterine embolization in patients who wish to maintain their uterine integrity and also a future pregnancy?

Patients with symptoms determined by a fibroma (metrorrhagia) and for whom myomectomy or myometrectomy is not an option, UAE has to be at least tried before moving on to treat the condition with a histerectomy, mainly because this method might also solve the symptomatology associated with the fibroma.

Psychological impact of using this method

There are studies that state the patients' satisfaction after the procedure in long term studies.

CONCLUSIONS

1. In spite of the fact that 20 year ago the treatment of uterine fibroma was realized exclusively by gynecologists, rapid development of minimally invasive endovascular approach devices along with developments in medical imaging hardware have led to the creation of a new curative technique, implemented by specialists in radiology, with a background in interventional radiology.
2. Uterine fibroma embolization represents the elective course of treatment, suitable for young female patients, with relatively low leyomata volumes, usually accompanied by symptoms affecting life quality.

3. Brachial artery approach facilitates a better recovery compared with the femoral or bi-femoral arterial puncture technique, both from a timely mobilization point of view and also by avoiding urinary catheterization.
4. From a financial stand-point, the embolization of uterine fibromas has been proven to be superior to the classical treatment options. Also there is less medical personnel involved in the intervention and the overall costs of the intervention are inferior.
5. Peri-interventional infection risks are significantly diminished due to the lack of a surgical incision site and also because of the sterile manner in which the intervention is conducted.
6. In sync with the rapid development of interventional radiology, materials associated with the minimally invasive techniques are becoming exponentially safer and more specialized, decreasing intra-interventional complication occurrence risk but also offering the interventional radiologist intra-operative comfort.
7. The material diversity aimed towards treatment of leiomyomata are giving the interventionist the opportunity for a personalized approach towards every patient, ensuring adequate therapy regardless of uterine artery diameters, conformation and consequent utero-ovarian anastomosis.
8. Radiation dose absorbed by the patient during the intervention is constantly being diminished in correspondence with the increasing experience of the interventionist, considering there is a strong correlation between uterine artery catheterization and exposure time.
9. Due to the intervention's minimally invasive character, the intra-interventional erithrocytic mass loss is practically negligible, rendering transfusion useless, thus avoiding unnecessary complications.
10. From a psychological standpoint, the concept of uterine fibroma embolization can be easier to cope with, compared with the classical techniques. For that matter, patients keep a sense of self esteem and personal integrity, promoting society and familial reintegration.
11. The lack of the need for general anesthesia for uterine fibroma embolization (UFE) is eliminating all risks associated with it.
12. The post-interventional pain syndrome can be quickly and efficiently controlled with intravenous medication administered immediately after the intervention's completion, maintaining analgesia for the first 48 hours post-intervention.
13. The ultrasonographic monitoring at present time intervals (in this particular case 1,3 and 6 months) offers an easy and non-invasive diagnostic tool for quantifying therapeutic effects, discovering the complete ceasing of symptoms in 157 cases.
14. MRI investigation shortly after the intervention and also at present time intervals offers valuable information about fibroma volume, patent fibromatous vessels, presence of necrosis and overall fibroma involution. Sadly, only 12 patients were able to have MRI scans taken, largely due to the increased cost of the investigation.

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