

Case Report

First Reported Death in India during MRgFUS: A Case Report

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Abstract

Uterine adenomyosis is an important problem for women of reproductive age. Although hysterectomy has been the traditional treatment for symptomatic fibroids, many child bearing women are interested in a less invasive therapy. Magnetic resonance-guided focused ultrasound (MRgFUS) is a new technique for treating a variety of solid tumors. The procedure is completely noninvasive. It is performed as an outpatient procedure and the patient can resume her normal activities the day following the procedure. A 39 years female came with c/o dysmenorrheal, menorrhagia and polymenorrhagia since 5 years. Patient's vitals were normal before procedure but patient suddenly collapsed and died after procedure. Dead body was forwarded for postmortem examination. During postmortem it was found that there was 3 liter of blood in peritoneum. As this is the safest outpatient procedure then what was the reason for this 3 liter of blood in abdominal cavity...?

Key Words: MRgFUS, Fibroids, Uterine Leiomyoma, MR-Guided, Magnetic Resonance Imaging, Ablation

Introduction:

Noninvasive treatment of tumors is highly desirable and provides an alternative to surgery. One such treatment undergoing active research is Magnetic resonance-guided focused ultrasound (MRgFUS).

The ultrasound beam carries a high level of energy and is brought to a tight focus. Energy carried by the beam is rapidly converted into heat and a rise in temperature is observed.

If the temperature at the target spot can be raised to more than 55°C, protein denaturation occurs, resulting in cell death and the creation of a cigar-shaped lesion of coagulative necrosis in the direction of the ultrasound beam. The tissue in the path of the ultrasound beam but away from the focus is warmed, but not to lethal temperatures, avoiding tissue damage except at the focus.

Principles of Focused Ultrasound Treatment (FUS): (Fig.1-3)

- High intensity focused ultrasound transducer in the table top of the MRI

- Targeting done using MR image
- Treatment performed under conscious sedation
- Treatment monitoring using MR thermometry
- Tissue is destroyed following multiple ultrasound sonications
- Patient goes home the same day
- Indication is for patients with *symptomatic* fibroids

Case History:

A female patient was admitted in a private hospital for infertility treatment in Mumbai with complaints of dysmenorrhea, menorrhagia & polymenorrhea since 5 yrs.

On MRI there was diffuse adenomyosis involving anterior & posterior walls. Patient was admitted in the morning & treatment was started at 12.30 pm, treatment was completed at 4 pm with 209 sonications.

At 4.19 pm Patient tried to stand post procedure & felt giddy & suddenly collapsed. In spite of all resuscitative measures Patient was declared dead on same day at 8.25 pm. Body was sent for P.M. examination at our center.

Autopsy Findings:

Post-mortem was conducted on the body of female.

External Examination:

Abdomen was distended, Conjunctiva was pale, Oozing of straw colored fluid from tongue & mouth, Injection marks were present

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over right thigh & both forearms with blood infiltration in surrounding tissue.

Internal Examination:

Abdominal wall was tense & distended, peritoneum was intact. On taking incision blood oozes out forcibly from peritoneal cavity.

Approximately 3 Liter of fluid blood was present in peritoneal cavity. (Fig. 4)

On further dissection of posterior abdominal fascia & soft tissue in right Iliac fossa showed blood infiltration.

On vessel dissection right uterine artery near uterus shows rupture near the uterus & Right ovarian artery also shows rupture with infiltration of blood in surrounding tissue Kidneys showed perinephric hemorrhage. (Fig. 5)

Cause of death was given as **“Hemorrhage & shock following rupture of lower abdominal vessels with perinephric hemorrhage Following MRgFUS therapy of uterus however final opinion reserved pending for Histopathological and Chemical analysis report”**

Discussion:

Techniques of treatment of uterine fibroids are still being refined, but significant progress has been made in understanding some of the challenges for this new technology.

Some fibroids are more responsive to the focused ultrasound; some fibroids are more resistant. Not all women are candidates for this procedure.

Absolute contraindications include location of bowel that is in the path of the ultrasound beam, or surgical scars in the beam pathway. The procedure of MRgFUS is feasible, safe and becoming increasingly popular.

Ultrasound frequencies in diagnostic radiology range from 2 to approximately 15 MHz. Medical ultrasound transducers contain more than one operating frequency viz. 2.5 – 3.5 MHz for general abdominal imaging and for ex. 5.0 – 7.5 MHz for superficial imaging.

MRgFUS sonication uses lower frequencies but higher intensities (up to 240W) Sonications

Expected Side Effects of MRgFUS Therapy:

1. Transitory:

About 30% patients may experience nausea, vomiting, leg and buttock pain, abdominal tenderness

2. Less Frequent, Transitory:

Less than 10% patients may experience swelling, abdominal cramping, vaginal bleeding, urinary difficulty and less than 3% patients may

experience first degree skin burns (skin redness) and general pelvic pain.

3. Very Rare Complications: (< 1% patients)

- Second and third degree skin burns, Neuropathy <0.1% and Injury to abdominal/pelvic organs in less than 0.1%. [9]

As per NICE interventional procedure guidelines 413, Scotland, Nov 2011 Side effects are, Sciatic nerve palsy, Skin burns, Spontaneous vaginal expulsion of t/t fibroid and Bowel perforation. [5]

If blood vessel comes in the pathway of MRgFUS it acts as heat sink with increase in temp at that site. The energy from MRgFUS may cause formation of small gas bubbles concentrating acoustic energy with increase in temp at that site. [6]

As per the studies done uptill now if a bowel or vessel comes in the pathway of MRgFUS the temperature at that site increases which can result in damage of that site of bowel or vessel resulting in to perforation at that site.

It is the one of the very rare complication of this procedure that we have found during autopsy.

Conclusion:

Uterine & ovarian artery have come in the pathway of MRgFUS therapy which caused damage to its intima with its rupture and bleeding due to which patient may have gone in to hypovolemic shock and died.

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Fig. 1: Procedure of MRgFUS

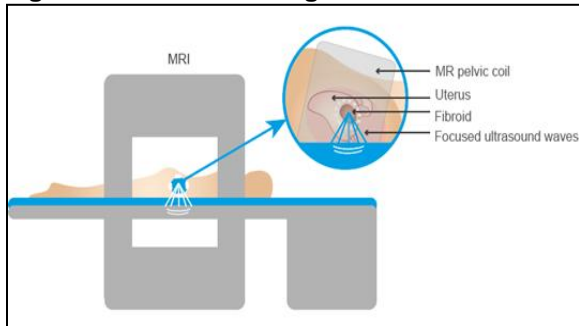


Fig. 2: Targeting of fibroid by Ultrasound beam

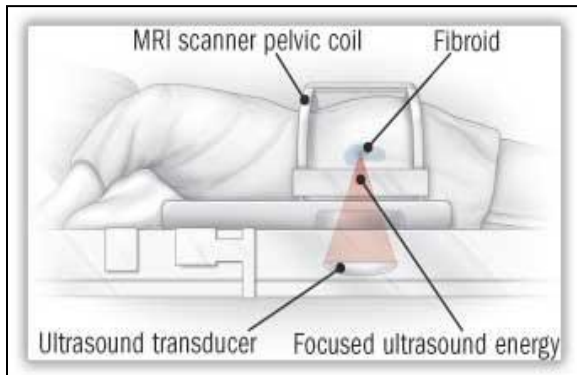


Fig. 3: Types of Uterine Fibroids

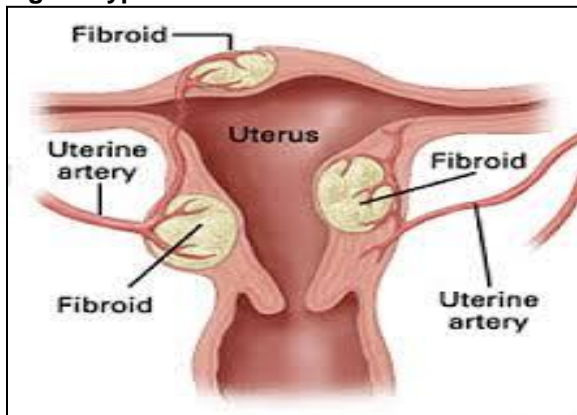


Fig. 4: Oozing of Blood Forcefully from Peritoneal Cavity after Incision

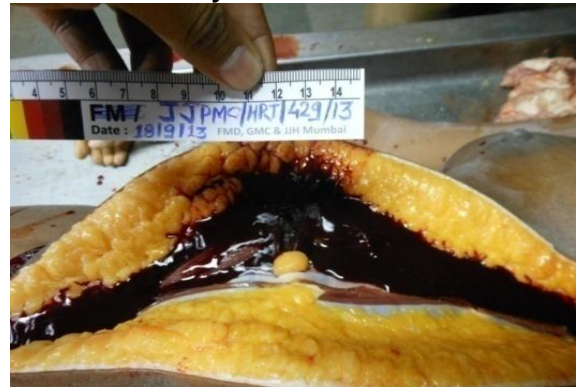


Fig. 5: Pelvic Hemorrhage due Rupture of Uterine and Ovarian Artery

