Case Report

Successful Magnetic Resonance Imaging-Guided Focused Ultrasound Surgery for Recurrent Uterine Fibroid Previously Treated with Uterine Artery Embolization

Sang-Wook Yoon, Kyoung Ah Kim, Sang Heum Kim, and Jong Tae Lee

Department of Diagnostic Radiology, CHA Bundang Medical Center, CHA University, 351 Yatap-dong, Bundang-gu, Sungnam-si, Gyunggi-do 463-712, Republic of Korea

Correspondence should be addressed to Sang-Wook Yoon, jansons@cha.ac.kr

Received 23 January 2010; Accepted 16 July 2010

Academic Editor: Michael Stark

Copyright © 2010 Sang-Wook Yoon et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

A 45-year-old premenopausal woman was referred to our clinic due to recurring symptoms of uterine fibroids, nine years after a uterine artery embolization (UAE). At the time of screening, the patient presented with bilateral impairment and narrowing of the uterine arteries, which increased the risk of arterial perforation during repeated UAE procedures. The patient was subsequently referred for magnetic resonance imaging-guided focused ultrasound surgery (MRgFUS) treatment. Following the treatment, the patient experienced a significant improvement in symptoms (symptom severity score was reduced from 47 to 12 by 1 year post-treatment). MR images at 3 months showed a 49% decrease in fibroid volume. There were no adverse events during the treatment or the follow-up period. This case suggests that MRgFUS can be an effective treatment option for patients with recurrent fibroids following previous UAE treatment.

1. Introduction

Uterine leiomyoma (fibroid) is the most common reproductive tract tumor in women of reproductive age. Fibroids have been clinically identified in at least 25% of women [1], and pathological analysis suggests that the prevalence of fibroids may be as high as 77% [2]. Symptomatic fibroids can significantly affect quality of life (QOL) and can result in heavy and prolonged menstrual flow, urinary frequency, pelvic pain, abdominal pressure, infertility, and dyspareunia [3–5].

Surgical treatments for uterine fibroids include hysterectomy and myomectomy [6]. Minimally invasive or noninvasive treatments include uterine artery embolization (UAE), magnetic resonance imaging-guided focused ultrasound surgery (MRgFUS), and hormonal therapy [6–9]. Each of these treatment options, which require minimal or no hospitalization, enables women to preserve their uteri [10] and usually minimize complications, recovery time, and treatment costs [11, 12].

UAE is a minimally invasive, image-guided therapy, in which the blood supply to the uterine fibroid is blocked by catheterization, and the ischemic necrosis of the fibroids is induced by the insertion of embolic particles [13]. The embolic particles are usually composed of polyvinyl alcohol, tris-acryl, or gelatin sponge material.

MRgFUS is a noninvasive treatment in which ultrasound energy, focused on the fibroid in multiple focal spots, raises the temperature of tissue within the focal zone and causes coagulative necrosis. MRI guides and monitors the procedure, thereby providing closed loop anatomical and thermal feedback [9].

Several measures are used to assess the efficacy of these minimally invasive or noninvasive treatments, including a Uterine Fibroids Symptoms Quality Of Life (UFS-QOL) assessment questionnaire [14], fibroid shrinkage, and patient...
Figure 1: Screening MR images: (a) coronal T2-weighted image showing two fibroids, (b) coronal T1-weighted contrast-enhanced image—the right fibroid is already nonenhancing, whereas the left one is still viable.

Figure 2: MR angiography. The reason for UAE unsuitability: (a) narrow left uterine artery, (b) no obvious right uterine artery.
Figure 3: Treatment images: (a) Sagittal T2-weighted planning image, (b) Sagittal contrast-enhanced T1-weighted posttreatment image showing 90% of nonenhancing volume on the left fibroid.

Figure 4: Coronal T2-weighted image three months post-treatment, showing 49% volume shrinkage of the treated fibroid.

Pretreatment T2-weighted MR images were obtained for procedure planning and for targeting the left fibroid. For the duration of the treatment, 35 sonications were delivered over approximately 1 hour, and thermal responses consistent with effective ablation were observed on the real-time temperature maps. T1-weighted contrast-enhanced images that were obtained immediately following the procedure showed a nonperfused volume (NPV) of 81 cc, which constitutes approximately 90% of the fibroid volume (Figure 3). The patient was discharged approximately 30 minutes after completion of the procedure and reported a return to normal activity and a regular work schedule after one day. The patient did not report any pain and was very satisfied with her rapid recovery compared to her previous UAE. There were no adverse events during or after the treatment.

Three months after the treatment, the patient reported significant symptom improvement. Contrast-enhanced T1-weighted and T2-weighted MR images, obtained at that time, revealed shrinkage of the treated fibroid by 49% (Figure 4). The patient’s SSS was 22, reflecting a 25-point decrease from the base-line score before the MRgFUS treatment. At the one-year follow-up assessment, her symptom severity score was further decreased to 12.

3. Discussion

We are currently noticing an increase in the number of uterine fibroid patients who seek minimally invasive or non-invasive treatment options. These options include laparoscopic surgeries, UAE, MRgFUS, and other modalities. Patients should be made aware of all the treatment options available for uterine fibroids, including invasive, minimally invasive or noninvasive procedures. The most clinically suitable treatment option should be recommended for each individual patient, according to her medical condition and personal needs.

UAE treatment may pose an increased risk in cases where the uterine artery is absent in the area of the fibroid, or when a highly tortuous uterine artery or ectopic arterial branches feed the fibroid [18]. Therefore, patients who present with one of these anatomical features, who have recurring symptoms and are seeking a minimally invasive or noninvasive treatment, may be referred for MRgFUS or hormonal therapy.

This paper demonstrates how patients can potentially benefit from alternative minimally invasive or noninvasive treatment options for symptomatic uterine fibroids. Specifically, MRgFUS treatment can be a good option for patients who were previously treated with UAE. Additional studies of the safety and efficacy of MRgFUS following UAE should be conducted.

Acknowledgments

The authors thank Suk Hee Kim and Seon Ha Yun for their helping in paper preparation.
References

[1] V. C. Buttram Jr. and R. C. Reiter, “Uterine leiomyomata: etiology, symptomatology, and management,” *Fertility and Sterility*, vol. 36, no. 4, pp. 433–445, 1981.

[2] S. F. Cramer and A. Patel, “The frequency of uterine leiomyomas,” *American Journal of Clinical Pathology*, vol. 94, no. 4, pp. 435–438, 1990.

[3] E. A. Stewart, “Uterine fibroids,” *Lancet*, vol. 357, no. 9252, pp. 293–298, 2001.

[4] B. J. Vollenhoven, A. S. Lawrence, and D. L. Healy, “Uterine fibroids: a clinical review,” *British Journal of Obstetrics and Gynaecology*, vol. 97, no. 4, pp. 285–298, 1990.

[5] K. Middendorf, A. Burges, A. Strauss, and H. Hepp, “Uterine fibroids—therapy from the point of view of the gynaecologist,” *Radiologe*, vol. 43, no. 8, pp. 615–623, 2003.

[6] N. Lund, P. Justesen, B. Elle, S. G. Thomsen, and C. Floridon, “Fibroids treated by uterine artery embolization,” *Acta Obstetricia et Gynecologica Scandinavica*, vol. 79, no. 11, pp. 905–910, 2000.

[7] E. Zupi, M. Pocek, M. Dauri et al., “Selective uterine artery embolization in the management of uterine myomas,” *Fertility and Sterility*, vol. 79, no. 1, pp. 107–110, 2003.

[8] B. S. Levy, “Modern management of uterine fibroids,” *Acta Obstetricia et Gynecologica Scandinavica*, vol. 87, no. 8, pp. 812–823, 2008.

[9] E. A. Stewart, B. Gostout, J. Rabinovici, H. S. Kim, L. Regan, and C. M. C. Tempany, “Sustained relief of leiomyoma symptoms by using focused ultrasound surgery,” *Obstetrics and Gynecology*, vol. 110, no. 2, pp. 279–287, 2007.

[10] R. T. Andrews, J. B. Spies, D. Sacks et al., “Patient care and uterine artery embolization for leiomyomata,” *Journal of Vascular and Interventional Radiology*, vol. 15, no. 2, pp. 115–120, 2004.

[11] H. Zowall, J. A. Cairns, C. Brewer, D. L. Lamping, W. M. W. Gedroyc, and L. Regan, “Cost-effectiveness of magnetic resonance-guided focused ultrasound surgery for treatment of uterine fibroids,” *BJOG*, vol. 115, no. 5, pp. 653–662, 2008.

[12] M. T. Beinfeld, J. L. Bosch, K. B. Isaacson, and G. S. Gazelle, “Cost-effectiveness of uterine artery embolization and hysterectomy for uterine fibroids,” *Radiology*, vol. 230, no. 1, pp. 207–213, 2004.

[13] J. G. Seals, P. A. Jones, and C. Wolfe, “Uterine artery embolization as a treatment for symptomatic uterine fibroids: a review of literature and case report,” *Journal of the American Academy of Nurse Practitioners*, vol. 18, no. 8, pp. 361–367, 2006.

[14] J. B. Spies, K. Coyne, N. Guauou Guaou, D. Boyle, K. Skyrnarz-Murphy, and S. M. Gonzalves, “The UFS-QOL, a new disease-specific symptom and health-related quality of life questionnaire for leiomyomata,” *Obstetrics and Gynecology*, vol. 99, no. 2, pp. 290–300, 2002.

[15] The Society of Obstetricians and Gynaecologists of Canada, “SOGC clinical practice guidelines. Uterine fibroid embolization (UFE),” *International Journal of Gynecology & Obstetrics*, vol. 89, pp. 305–318, 2005.

[16] S. C. Goodwin and J. B. Spies, “Uterine fibroid embolization,” *New England Journal of Medicine*, vol. 361, no. 7, pp. 690–697, 2009.

[17] S.-W. Yoon, C. Lee, S. H. Cha et al., “Patient selection guidelines in MR-guided focused ultrasound surgery of uterine fibroids: a pictorial guide to relevant findings in screening pelvic MRI,” *European Radiology*, vol. 18, no. 12, pp. 2997–3006, 2008.

[18] K. Firouznia, H. Ghanati, M. Sanaati, A. H. Jalali, and M. Shakiba, “Uterine artery embolization in 101 cases of uterine fibroids: do size, location, and number of fibroids affect therapeutic success and complications?” *CardioVascular and Interventional Radiology*, vol. 31, no. 3, pp. 521–526, 2008.