Magnetic Resonance Guided Focused Ultrasound Surgery for Leiomyoma and Adenomyosis: An Alternative Noninvasive Treatment Option

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Abstract

Magnetic resonance guided high-intensity focused ultrasound surgery is a promisingly alternative method for curing symptomatic leiomyoma and adenomyosis. In this article, we mainly introduced 2 typical patients with leiomyoma and adenomyosis underwent magnetic resonance guided high-intensity focused ultrasound surgery successfully. We aimed to recommend that magnetic resonance guided high-intensity focused ultrasound surgery should be considered as an innovative noninvasive option for patients with leiomyoma and adenomyosis.

Keywords: Leiomyoma; Adenomyosis; Magnetic resonance guided focused ultrasound surgery; Alternative noninvasive option

Introduction

Leiomyoma and adenomyosis are two of most common gynecological benign diseases that influence adversely on the health of reproductive-age patients. The prevalence of leiomyoma is approximate 70-80% meanwhile that of the adenomyosis extends from 5% to 70% owing to dissimilarity in ethnicity [1,2]. Magnetic resonance-guided focused ultrasound surgery (MRgFUS) was based on the biological thermal effect of high intensity focused ultrasound on the convergent tissue to elevate the tissue temperature up to the threshold of coagulative necrosis and protein degeneration [3]. MRgFUS was adopted worldwide as an alternatively therapeutic option to conventional treatment methods for leiomyoma and adenomyosis [4,5]. In this article, we mainly introduced 2 typical patients with leiomyoma and adenomyosis underwent MRgFUS fortuitously.

Figure 1: Sagittal T2-weighted pretreatment image shows type II leiomyoma.
Figure 2: Axial perfusion-weighted pretreatment image shows type A leiomyoma.

Figure 3: Coronal contrast enhancement T1-weighted posttreatment image shows nearly ablation of leiomyoma.

Figure 4: Sagittal T2-weighted image at 6-month follow-up shows significant shrinkage of leiomyoma.

Report

Patient with leiomyoma

A 38-year-old-woman with body mass index of 22.3 and transformed symptom severity score (tSSS) of 75, was indicated magnetic resonance imaging for assessing the leiomyoma characteristics prior to MRgFUS. MRI findings revealed anatomy and leiomyoma characteristics: subserosal leiomyoma located on
the anterior wall of retroverted uterus and leiomyoma volume of 118 ml. According to T2-classification (type I if T2 signal-intensity (T2SI) of leiomyoma ≥ T2SI of skeletal muscle; type II if T2SI of skeletal muscle < T2SI of leiomyoma < T2SI of myometrium; type III if T2SI of leiomyoma ≥ T2SI of myometrium) [6,7], leiomyoma was classified as type II (Figure 1). According to perfusion classification (type A if time signal-intensity curve (TSIC) of leiomyoma < TSIC of myometrium; type B if TSIC of leiomyoma ≥ TSIC of myometrium), leiomyoma in this case was regarded as type A (Figure 2) [8,9]. The serum Anti-Müllerian hormone (AMH) level prior to treatment was 1.18 ng/mL. MRgFUS yielded a post treatment non perfused volume (NPV) ratio of 94% (Figure 3). At 6-month follow-up, the leiomyoma volume was decreased significantly to 62 ml with the corresponding leiomyoma volume reduction ratio of 47% (Figure 4) and tSSS was attenuated significantly to 0 with corresponding symptom improvement ratio of 100%. Furthermore, the serum AMH was comprehensively conserved [9,10]. During and after ablation procedure, there were no severe adverse events observed.

Patient with adenomyosis

A 40-year-old woman with body mass index of 20.5 and tSSS of 50, was indicated magnetic resonance imaging for assessing the adenomyosis characteristics prior to MRgFUS. MRI findings displayed anatomy and adenomyosis characteristics: adenomyosis lesion located on the posterior wall of retroverted uterus and focal adenomyosis type with the junctional zone width of 40 mm (Figure 5). According to perfusion classification (type A if time signal-intensity curve (TSIC) of adenomyosis < TSIC of myometrium; type B if TSIC of adenomyosis ≥ TSIC of myometrium) [11,12], adenomyosis in this case was considered as type A (Figure 6). The serum Anti-Müllerian hormone (AMH) level was 2.11 ng/mL. MRgFUS generated a posttreatment NPV ratio of 92% (Figure 7). At 6-month follow-up, the junctional zone width was decreased significantly to 30 mm with the corresponding junctional zone width reduction ratio of 25% (Figure 8) and tSSS was alleviated significantly to 6.25 with corresponding symptom improvement ratio of 87.5%. In addition, the serum AMH was thoroughly preserved [9,10]. No complications were reported.

Figure 5: Sagittal T2-weighted pretreatment image shows focal adenomyosis on the posterior wall of uterus.

Figure 6: Axial perfusion-weighted pretreatment image show type A adenomyosis.
Discussion

In addition to drugs, surgery, intrauterine device and uterine arterial embolization, MRgFUS is regarded as an alternative treatment for uterine leiomyoma and adenomyosis. Several studies proved that MRgFUS is a safe interventional method with low rate of adverse events and quick recovery of normal activities in 24 hours [4-12]. In this article, the NPV ratio of two cases was obtained over 90% for adenomyosis and leiomyoma; therefore the symptom improvement ratio and lesion shrinkage ratio were significantly better owing to the principle “The higher the NPV ratio is, the greater the symptom improvement is”. In addition, there were no converse effects on ovarian function by comprehensive preservation of serum AMH level prior to treatment and post-treatment follow-up. In fact, MRgFUS is focused solely on the targeted lesion without sonicating through ovarian tissue and ovarian arteries. The present report revealed that MRgFUS is an effective method for eradicating leiomyoma and adenomyosis without complications in line with previous studies [7-11]. Nonetheless, further studies with large population are very essential to investigate the detailed complications, ovarian function and reproductive function with longer follow-up time up to 12 months and 24 months after MRgFUS so as to have comprehensively view of efficacy and safety of this treatment.

Conclusion

The MRgFUS approach for symptomatic leiomyoma and adenomyosis in this case report is achievable, safe, and noninvasive with favourable outcomes.

Disclosure Statement

Informed consent to all patients in this article was obtained. All authors read and approved manuscript. The authors of this manuscript declare no conflict of interest.

References


