

Long-term Clinical Outcomes of US-Guided High-Intensity Focused Ultrasound Ablation for Symptomatic Submucosal Fibroids: A Retrospective Comparison with Uterus-Sparing Surgery

Yang Wang, MD, Xin Liu, MD, Wei Wang, MD, Jie Tang, MD, Lei Song, MD

Rationale and Objectives: Uterus-sparing surgery and ultrasound (US)-guided high-intensity focused ultrasound (HIFU) ablation are both treatment options for symptomatic submucosal fibroids. No study had compared the long-term clinical outcomes between the two techniques. Therefore, the aim of this study was to compare the long-term clinical outcomes between US-guided HIFU ablation and uterus-sparing surgery for the treatment of symptomatic submucosal fibroids.

Materials and Methods: A retrospective study was conducted on 245 women who were treated by US-guided HIFU ablation and 129 women who underwent uterus-sparing surgery for type I or type II symptomatic submucosal fibroids in a single institution from January 2007 to January 2015. The mean diameter of the fibroids was about 6 cm in both groups. They were followed up until December 2018. The symptom relief rate, symptom recurrence rate and incidence of major complications were compared between the two groups.

Results: The symptom relief rate was 95.9% for US-guided HIFU ablation and 89.1% for uterus-sparing surgery. The cumulative symptom recurrence rate at 1-, 3-, 5-, and 8 years was 1.7%, 6.8%, 9.4%, and 11.9% for US-guided HIFU ablation and 6.1%, 12.2%, 22.6%, and 27.8% for uterus-sparing surgery. Compared to uterus-sparing surgery group, US-guided HIFU ablation had a statistically higher symptom relief rate and a lower symptom recurrence rate ($p < 0.05$). The major complication rate was 3.1% in the uterus-sparing surgery group. No major complications occurred in the US-guided HIFU ablation group.

Conclusion: This study showed that the long-term clinical outcomes of US-guided HIFU ablation may be better than that of uterus-sparing surgery for the treatment of symptomatic submucosal fibroids. US-guided HIFU ablation may also be safer than uterus-sparing surgery. Further larger randomized trials are needed to confirm these findings.

Keywords: Uterine fibroids; High-intensity focused ultrasound ablation; Ultrasound imaging; Myomectomy.

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Abbreviations: HIFU high-intensity focused ultrasound, US ultrasound, MRI magnetic resonance imaging, UFS-QOL uterine fibroid symptoms quality-of-life, tSSS transformed symptom severity scale

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From the Department of Ultrasound, Chinese PLA General Hospital, 28 Fuxing Road, Beijing 100853, China (Y.W., X.L., W.W., J.T.); Department of Obstetrics and Gynecology, Chinese PLA General Hospital, Beijing, China (L.S.). Received March 31, 2020; revised April 25, 2020; accepted May 5, 2020.

Address correspondence to: W.W. e-mail: wangw1016@aliyun.com

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INTRODUCTION

Submucosal fibroids are noncancerous tumors that develop below the lining of the endometrium. Compared to intramural and subserosal fibroids, submucosal fibroids are more likely to cause abnormal uterine bleeding, dysmenorrhoea, and infertility in women of child-bearing age (1). According to the International Federation of Gynecology and Obstetrics classification, submucosal fibroids are classified into three types: type 0 (pedunculated fibroid without intramural extension), type I (sessile with an

intramural extension less than 50%), and type II (sessile with an intramural extension of at least 50%) (2).

Uterus-sparing surgery is the modality of choice for symptomatic fibroids in patients who choose to preserve their uterus. Fibroids can be removed surgically by open myomectomy, laparoscopy, or hysteroscopy, depending on the number, size, and location of the tumors (3–13). Type 0 submucosal fibroids can be easily removed by hysteroscopy. However, complete surgical resections for type I and type II submucosal fibroids can be technically challenging especially for tumors with a deep intramural extension. Residual tumor due to incomplete resection may influence the treatment effectiveness and cause relapse of symptoms necessitating additional interventions. These surgical techniques require hospital stay, have a relatively long recovery time, and are associated with various kinds of complications. Open myomectomy and laparoscopic myomectomy have risks like intraoperative hemorrhage, postoperative adhesion formation and uterine rupture during pregnancy and labor (3–11). Hysteroscopic myomectomy has risks such as intraoperative uterine perforation, ascending genitourinary infection, and iatrogenic adenomyosis (12,13).

High-intensity focused ultrasound (HIFU) ablation is a minimal-invasive technique which can yield heat-induced coagulative necrosis without surgical incisions. Under image guidance, a well-defined coagulative area can be induced at depth in the focal area, through the intact skin (14). This technique requires no overnight hospital stay, has a rapid improvement of symptoms and few complications. In the past decades, HIFU ablation has been used for the treatment of symptomatic uterine fibroids, yielding promising therapeutic results (15–20). In our previous study, we had proved that ultrasound (US)-guided HIFU ablation is safe and effective for the treatment of symptomatic type I and type II submucosal fibroids (21). However, to our knowledge, there are no reports comparing the long-term clinical outcomes between US-guided HIFU ablation and uterus-sparing surgery in patients with symptomatic submucosal fibroids. Therefore, the aim of this study was to compare the effectiveness of the treatment, recurrence of fibroid-associated symptoms, further need for additional interventions, and rate of major complications in women with symptomatic submucosal fibroids that are treated by US-guided HIFU ablation with those women who underwent uterus-sparing surgery.

MATERIALS AND METHODS

Patients

The study population was drawn from the medical records of all premenopausal women with symptomatic type I or type II uterine fibroids who were admitted to the general hospital of PLA from January 2007 to January 2015. The fibroids were classified as type I or type II submucosal fibroids on pretreatment contrast-enhanced magnetic resonance imaging (MRI).

The uterus-sparing surgery (open myomectomy, laparoscopic myomectomy, or hysteroscopic myomectomy) was

performed under general anesthesia by surgeons in the department of gynecology. The US-guided HIFU ablation was performed under conscious sedation by one physician (W.W., 16 years of experience in HIFU ablation) in the department of ultrasound. Generally, the patients choose surgery or HIFU ablation themselves. If the patients could not tolerate general anesthesia or surgery, HIFU ablation was the treatment option. If the patients did not have a safe pathway of energy beam, surgery was the treatment option.

HIFU Ablation Technique

A JC HIFU unit (Chongqing Haifu Technology, Chongqing, China) was used for patients receiving US-guided HIFU ablation. The unit has a focal area of 9.8 mm along the beam axis and 1.3 mm in the transverse direction. The maximum output of the unit was 520 W. The ablation strategy was reported in detail in our previous study (21). The exclusion criteria for HIFU ablation were as follows: (1) presence of bowel which could not be pressed away from the proposed pathway of energy beam; (2) extensive abdominal scar; (3) unable to lie in the prone position; (4) contraindication to contrast-enhanced MRI and contrast-enhanced ultrasound. During treatment, the fibroids were enveloped by the ablation areas as much as possible if the ablation was tolerated by the patients. For patients who wished to preserve fertility, the focus of the energy beam was kept 1 cm away from the endometrium, for patients who did not wish to preserve fertility, the focus of the energy beam was extended further to the border between the fibroid and the endometrium.

Assessment of Treatment Outcomes

We contacted patients by telephone or email between June 2017 and December 2018 to complete a survey regarding the clinical outcomes after treatment. First, the patients were asked to complete the uterine fibroid symptoms quality-of-life (UFS-QOL) questionnaire. The UFS-QOL questionnaire consists of an eight-item symptom severity scale and 29 health-related QOL items which has been validated for assessing the severity of fibroid-associated symptoms and quality of life of the patients (22–24). As this was a retrospective study, the institutional review board approval of the informed consent for the UFS-QOL questionnaire was waived. In our hospital, it is routine for patients to fill out the UFS-QOL questionnaire prior to treatment. Patients were also asked to complete the questionnaire when they referred to our hospital for follow-up. A subset of patients did the UFS-QOL questionnaire 6 months after treatment during clinical follow-up while others recalled symptoms later during the follow-up for long-term results in 2017–2018. The raw scores were converted to a transformed symptom severity scale (tSSS) using the following formula: transformed score = (raw score – 8)/32 × 100. The transformed score has a range of 0–100, lower scores indicated better relief of symptoms. It was used in this study to quantitatively assess the

effectiveness of the treatment. The treatment was considered to be successful with a significant decrease of tSSS score at 6 months after treatment and sustained symptom relief thereafter (25).

The patients were also asked to report whether they had recurrence of fibroid-associated symptoms, when the symptoms recurrence happened, whether they had undergone any additional interventions to alleviate the recurrent symptoms, menopause, and treatment-associated complications. Minor complications were defined as temporary and self-limiting symptoms that required no therapy. Major complications were defined as those that required further intervention or those that resulted in permanent sequelae (26).

During follow-up, abdominal and transvaginal ultrasound were performed in all patients after treatment. In patients receiving uterus-sparing surgery, contrast-enhanced MRI was performed when necessary. Both contrast-enhanced MRI and contrast-enhanced ultrasound were performed in all patients receiving US-guided HIFU ablation. The first imaging follow-up was performed within 1 week after treatment. The nonperfused ratio (the volume of the nonperfused area divided by the entire volume of the fibroid) was calculated on the first contrast-enhanced MRI after HIFU ablation. Then, as required by another study, the patients were followed up at 3 month, 6 month, 1 year after treatment and at a 1-year interval thereafter.

Statistical Analysis

Normally distributed data was reported as the mean $\pm$ SD while non-normally distributed data was reported as median and interquartile range. Student *t* test or Wilcoxon signed rank test was used for comparison between continuous variables. The chi-square and Fisher's exact tests were used for comparison between categorical variables. The Kaplan-Meier method with log-rank testing was used to estimate the cumulative rate of symptoms recurrence over time. Statistical analyses were conducted with the SPSS 17.0 software (IBM Corporation Inc, Armonk, NY). $p < 0.05$ was considered statistically significant.

RESULTS

The patients were followed up until December 2018. Patients who were lost during follow-up were excluded from this study. Complete follow-up was obtained in 129 patients

receiving uterus-sparing surgery and 245 patients receiving US-guided HIFU ablation. The median follow-up time was 89 months (range, 40–140 months) and 78 months (range, 24–137 months) respectively. About 85% (110/129) patients in the surgery group completed the UFS-QOL questionnaire 6 months after treatment when they referred to our hospital for follow-up. Nineteen patients in the surgery group did not come back to our hospital after treatment. They recalled their symptoms later for the long-term results in 2017–2018. All patients in the HIFU group completed the UFS-QOL questionnaire 6 months after treatment.

In the uterus-sparing surgery group, 49 patients received open myomectomy, 74 patients received laparoscopic myomectomy, and 6 patients received hysteroscopic myomectomy. The age of the patients was 38.9 ± 6.2 years (range, 23–53 years). The maximum diameter of the fibroids was 6.0 ± 2.1 cm (range, 1.8–11 cm). The fibroids were classified as type I in 11 patients and type II in 118 patients.

In the US-guided HIFU ablation group, the age of the patients was 38.8 ± 6.3 years (range, 25–52 years). Two hundred and forty-one patients had only one submucosal fibroid, four patients had multiple submucosal fibroids. The maximum diameter of the fibroids was 6.0 ± 1.9 cm (range, 1.6–12 cm). The fibroids were classified as type I in 22 patients and type II in 223 patients. In these patients, 162 did not have desire for future fertility, 83 had desire for future fertility.

Before treatment, all patients had fibroid-associated symptoms. Increased and/or prolonged menstrual bleeding were the most prominent symptoms influencing the quality of life. The median baseline tSSS was 34 (range, 10–60) in the surgery group and 40 (12–66) in the HIFU group. There were no statistical differences in patient age, maximum fibroid diameter, type of fibroid, and median baseline tSSS between the two groups (Table 1).

After treatment, sustained symptoms relief and significant tSSS decrease was observed in 115 patients in the surgery group, and in 235 patients in the HIFU ablation group. The abnormal menstrual bleeding was significantly improved or disappeared after successful treatment. The symptom relief rate of uterus-sparing surgery was 89.1% (115/129), the median tSSS at 6 month after treatment was 8.0 (range, 0–15), with a mean decrease of 25.4 from baseline. The symptom relief rate of US-guided HIFU ablation was 95.9% (235/245), the median tSSS at 6 month after treatment was

TABLE 1. The Patient and Fibroid Characteristics Before Treatment

Variables	Uterus-Sparing Surgery (<i>n</i> = 129)	US-Guided HIFU Ablation (<i>n</i> = 245)	<i>p</i> Value
Age (years)	38.9 ± 6.2 (23–53)	38.8 ± 6.3 (25–52)	0.304
Maximum Tumor diameter (cm)	6.0 ± 2.1 (1.8–11)	6.0 ± 1.9 (1.6–12)	0.365
Type of fibroids			0.883
type I	11	22	
type II	118	223	
Baseline tSSS	34 (10–60)	40 (12–66)	0.178

tSSS, transformed symptom severity scale.

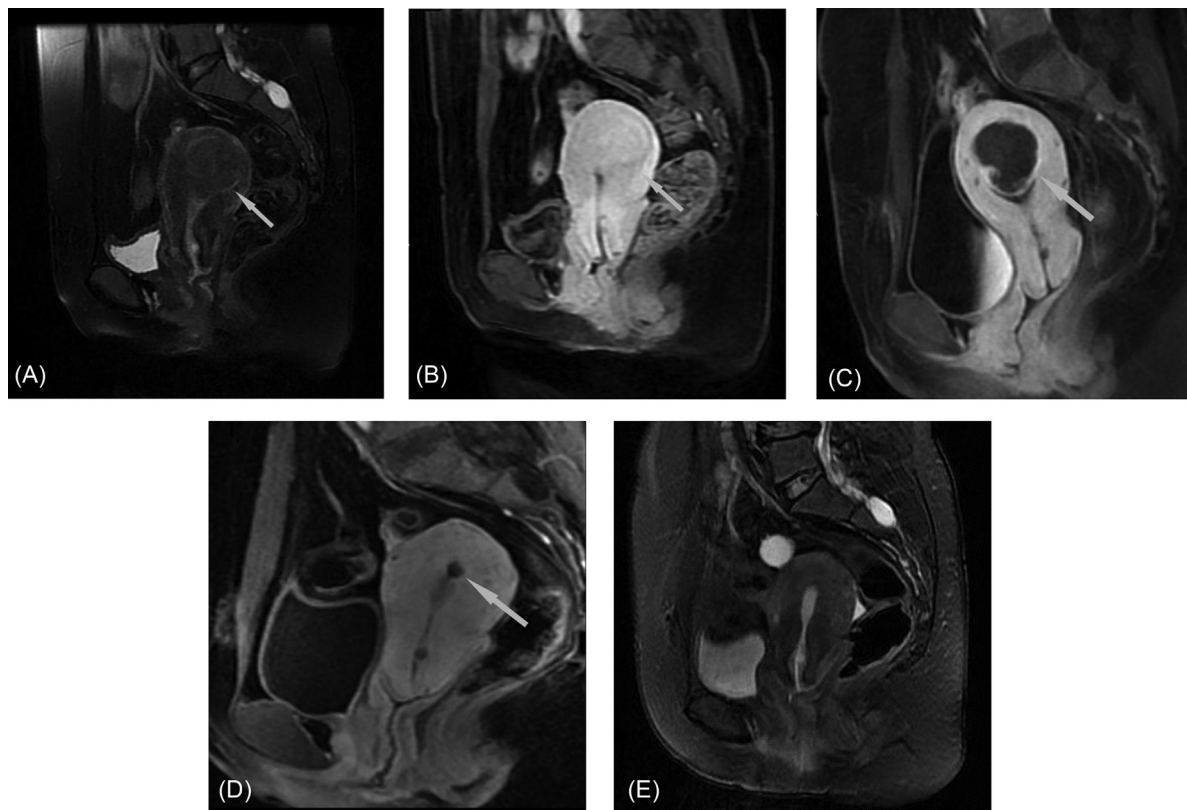


Figure 1. Sagittal MRI of a 34-year-old woman receiving US-guided HIFU ablation of a type II symptomatic submucosal fibroid. (A) Before treatment, the fibroid had a maximum diameter of 4.3 cm, the margin of the fibroid was more clearly on T2-weighted MRI. (B) Before treatment, the fibroid showed enhancement on T1-weighted contrast-enhanced MRI. (C) One day after treatment, a well-defined nonperfused ablation area was shown on T1-weighted contrast-enhanced MRI, the nonperfused ratio was 96%. (D) Six months after treatment, the ablated fibroid shrank significantly on T1-weighted contrast-enhanced MRI. (E) One year after treatment, the entire ablated fibroid was discharged from vagina and was undetectable on T2-weighted MRI.

10.2 (range 0–14), with a mean decrease of 30.5 from baseline. The symptom relief rate of US-guided HIFU ablation was significantly higher than that of uterus-sparing surgery ($p < 0.05$).

A large proportion of the fibroids became nonperfused on contrast-enhanced ultrasound performed immediately after successful HIFU ablation. The mean nonperfused ratio was 84% (range, 70%–100%) on the first contrast-enhanced MRI performed within 1 week after treatment. The treated fibroids began to shrink from 3 months after HIFU ablation (Fig 1). Vaginal discharge of necrotic tissue was seen in 60% (141/235) patients after successful HIFU ablation. The discharge appeared in the first menstrual period after treatment and disappeared within eight months after treatment. In 12 patients, the entire ablated fibroids were discharged from vagina, requiring no intervention.

At the end of follow-up, the fibroid-associated symptoms recurred in 27.8% (32/115) patients in the surgery group, and in 11.9% (28/235) patients in the HIFU ablation group. The median recurrent time since the primary treatment was 44 months (range, 8–96 months) and 36 months (range, 10–100 months) respectively. The cumulative rate of symptoms recurrence at 1-, 3-, 5-, and 8 year of follow-up in the surgery group was 6.1% (7/115), 12.2% (14/115), 22.6%

(26/115), and 27.8% (32/115), respectively. The cumulative rate of symptoms recurrence at 1-, 3-, 5-, and 8 years of follow-up in the HIFU ablation group was 1.7% (4/235), 6.8% (16/235), 9.4% (9.4/235), and 11.9% (28/235), respectively (Fig 2). The result of the Kaplan-Meier method demonstrated that the cumulative symptoms recurrence rate after US-guided HIFU ablation at 1-, 3-, 5-, and 8 years were significantly lower from that after uterus-sparing surgery ($p < 0.05$).

For patients who had recurrence of fibroid-associated symptoms after uterus-sparing surgery, 21 patients received additional interventions which included hysterectomy ($n = 7$), myomectomy ($n = 11$), and hormone treatment ($n = 3$). Eleven patients refused further treatment. For patients who had recurrence of fibroid-associated symptoms after US-guided HIFU ablation, 24 patients received additional interventions which included hysterectomy ($n = 8$), myomectomy ($n = 8$), HIFU ablation ($n = 5$), and hormone treatment ($n = 3$). Four patients refused further treatment.

Major complications were observed in four patients in the uterus-sparing group. Perioperative complications included one pelvic abscess and one pelvic hematoma requiring drainage, late complications included one incision hernia and one abdominal wall endometriosis. The major complication rate

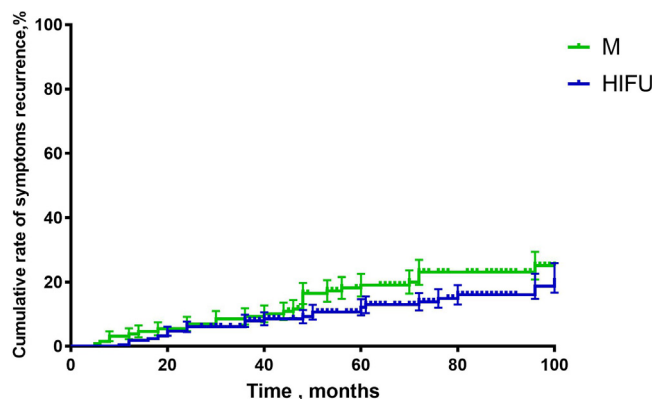


Figure 2. The cumulative symptoms recurrence rate after uterus-sparing surgery and US-guided HIFU ablation with Kaplan-Meier curve. M is myomectomy.

of the uterus-sparing surgery group was 3.1%. No major complications were observed in patients underwent US-guided HIFU ablation.

DISCUSSION

HIFU ablation is a new conservative technique for the treatment of uterine fibroids. Unlike other minimally invasive techniques such as radiofrequency and microwave, it is not restricted by the size of the fibroids, as long as a safe energy beam pathway is present. Both small and large fibroids could be ablated in one session. As the ablation is *in situ*, it needs no incision and leaves no scar on the uterus wall, the endometrium and uterine cavity could be protected under imaging guidance, the risk of implantation of endometrium could be minimized. Thus, compared with uterus-sparing surgery, HIFU ablation is theoretically safer and less likely to influence future fertility and pregnancy. These properties make it a promising treatment option for symptomatic submucosal fibroids.

In this study, the long-term clinical outcomes after US-guided HIFU ablation for symptomatic submucosal fibroids were presented and compared with that of uterus-sparing surgery. US-guided HIFU ablation showed a statistically higher effective rate and a lower cumulative symptom recurrence rate than uterus-sparing surgery. The possible reason may be that HIFU ablation was more effective in treating the intramural extension of the fibroids. The submucosal fibroids in both groups were relatively large with a mean diameter about 6 cm, most fibroids had a deep intramural extension. Thus, complete resection of the intramural extension and suture of the uterus wall may be difficult for uterus-sparing surgery, more residual tumors may be left during operation which may account for the lower effective rate and higher symptoms recurrence rate during follow-up. However, the intramural extension of the fibroids could be safely and effectively ablated under US guidance. The JC HIFU unit was capable enough to yield a large area of coagulative necrosis inside the

symptomatic submucosal fibroids, which can ensure sustainable symptom relief after treatment (21). Under US guidance, the area could be adjusted according to the shape and location of the fibroids, thus, the intramural extension of the fibroids could be encompassed well and fewer intramural residual tumors may be left during treatment. Therefore, compared to uterus-sparing surgery, US-guided HIFU ablation yielded a statistically higher symptom relief rate after treatment and a lower symptom recurrence rate during follow-up.

Safety is a major concern for both groups. As a more aggressive technique, uterus-sparing surgery was associated with a low rate of major complications in this study. However, by keeping the focus area away from vulnerable structures like bowel, no major complications were seen in the US-guided HIFU ablation group. The results suggested that US-guided HIFU ablation may be safer than uterus-sparing surgery for the treatment of symptomatic submucosal fibroids.

This study had some limitations. First, it was a retrospective study, patients' selection and recall bias may influence the clinical outcomes. It would be difficult for patients to accurately remember when symptoms recurred and what symptoms were like when interviewed. Second, the effectiveness of US-guided HIFU ablation could be influenced by the operator's experience. Inexpertise of the HIFU operator may result in less satisfactory outcomes and more complications. Third, the ablation zone of HIFU ablation was modified according to the desire of future fertility. Patients who had no desire for future fertility may have more complete treatment than patients who had desire for future fertility, which may influence the success rate. Fourth, fertility success after both treatments is an important outcome measure to be evaluated but was beyond the scope of this study. Future randomized controlled trials were warranted for more accurate comparison of the long-term clinical outcomes between US-guided HIFU ablation and uterus-sparing surgery.

CONCLUSION

In conclusion, our study suggested that the long-term clinical outcomes of US-guided HIFU ablation may be better than that of uterus-sparing surgery for the treatment of symptomatic submucosal fibroids. US-guided HIFU ablation may also be safer than uterus-sparing surgery. Further larger randomized trials are needed to confirm these findings.

REFERENCES

- Okolo S. Incidence, aetiology and epidemiology of uterine fibroids. *Best Pract Res Clin Obstet Gynaecol* 2008; 22:571–588.
- Munro MG, Critchley HO, Fraser IS, et al. The FIGO classification of causes of abnormal uterine bleeding in the reproductive years. *Fertil Steril* 2011; 95:2204–2208.
- Catanzarite T, Saha S, Rambachan A, et al. Impact of operative time on perioperative morbidity in abdominal myomectomy. *J Minim Invasive Gynecol* 2014; 21:S34–S35.
- West S, Ruiz R, Parker WH. Abdominal myomectomy in women with very large uterine size. *Fertil Steril* 2006; 85:36–39.

5. Kelly BA, Bright P, Mackenzie IZ. Does the surgical approach used for myomectomy influence the morbidity in subsequent pregnancy? *J Obstet Gynaecol* 2008; 28:77–81.
6. Jin C, Hu Y, Chen XC, et al. Laparoscopic versus open myomectomy—a meta-analysis of randomized controlled trials. *Eur J Obstet Gynecol Reprod Biol* 2009; 145:14–21.
7. Yoo EH, Lee PI, Huh CY, et al. Predictors of leiomyoma recurrence after laparoscopic myomectomy. *J Minim Invasive Gynecol* 2007; 14:690–697.
8. Iavazzo C, Mamais I, Gkegkes ID. Robotic assisted vs laparoscopic and/or open myomectomy: systematic review and meta-analysis of the clinical evidence. *Arch Gynecol Obstet* 2016; 294:5–17.
9. Seracchioli R, Rossi S, Govoni F, et al. Fertility and obstetric outcome after laparoscopic myomectomy of large myomata: a randomized comparison with abdominal myomectomy. *Hum Reprod* 2000; 15:2663–2668.
10. Gambacorti-Passerini Z, Gimovsky AC, Locatelli A, et al. Trial of labor after myomectomy and uterine rupture: a systematic review. *Acta Obstet Gynecol Scand* 2016; 95:724–734.
11. Silva-Filho AL, Wernick RA, de Magalhães RS, et al. Abdominal vs vaginal hysterectomy: a comparative study of the postoperative quality of life and satisfaction. *Arch Gynecol Obstet* 2006; 274:21–24.
12. Ioannis S, Aristotelis A, Antonios T, et al. Fertility rates after hysteroscopic treatment of submucous myomas depending on their type. *Gynecological Surgery* 2006; 3:206–210.
13. Di Spiezio Sardo A, Mazzon I, Bramante S, et al. Hysteroscopic myomectomy: a comprehensive review of surgical techniques. *Hum Reprod Update* 2008; 14:101–119.
14. Haar GT, Coussios C. High intensity focused ultrasound: past, present, and future. *Int J Hyperthermia* 2007; 23:85–87.
15. Stewart EA, Gedroyc WM, Tempny C, et al. Focused ultrasound treatment of uterine fibroid tumors: safety and feasibility of a noninvasive thermoablative technique. *Am J Obstet Gynecol* 2003; 189:48–54.
16. Stewart EA, Rabinovici J, Tempny CM, et al. Clinical outcomes of focused ultrasound surgery for the treatment of uterine fibroids. *Fertil Steril* 2006; 85:22–29.
17. Gorny KR, Woodrum DA, Brown DL, et al. Magnetic resonance-guided focused ultrasound of uterine leiomyomas: review of a 12-month outcome of 130 clinical patients. *J Vasc Interv Radiol* 2011; 22:857–864.
18. Jacoby VL, Kohi MP, Poder L, et al. PROMISE trial: a pilot, randomized, placebo-controlled trial of magnetic resonance-guided focused ultrasound for uterine fibroids. *Fertil Steril* 2016; 10:773–780.
19. Wang Y, Wang ZB, Xu YH. Efficacy, efficiency, and safety of magnetic resonance-guided high-intensity focused ultrasound for ablation of uterine fibroids: comparison with ultrasound-guided method. *Korean J Radiol* 2018; 19:724–732.
20. Chen J, Li Y, Wang Z, et al. Evaluation of high-intensity focused ultrasound ablation for uterine fibroids: an IDEAL prospective exploration study. *BJOG* 2018; 125:354–364.
21. Wei W, Yang W, Ting W, et al. Safety and efficacy of US-guided high-intensity focused ultrasound for treatment of submucosal fibroids. *Eur Radiol* 2012; 22:2553–2558.
22. Spies JB, Coyne K, Guaou NG, et al. The UFS-QOL, a new disease-specific symptom and health-related quality of life questionnaire for leiomyomata. *Obstet Gynecol* 2002; 99:290–300.
23. Froeling V, Meckelburg K, Schreiter NF, et al. Outcome of uterine artery embolization versus MR-guided high-intensity focused ultrasound treatment for uterine fibroids: long-term results. *Eur J Radiol* 2013; 82:2265–2269.
24. Mohr-Sasson A, Machtinger R, Mashiach R, et al. Long-term outcome of MR-guided focused ultrasound treatment and laparoscopic myomectomy for symptomatic uterine fibroid tumors. *Am J Obstet Gynecol* 2018; 219:375e1–375e7.
25. Dubuisson JB, Fauconnier A, Chapron C, et al. Second look after laparoscopic myomectomy. *Hum Reprod* 1998; 13:2102–2106.
26. Pundir J, Walawalkar R, Seshadri S, et al. Perioperative morbidity associated with abdominal myomectomy compared with total abdominal hysterectomy for uterine fibroids. *J Obstet Gynaecol* 2013; 33:655–662.