

Case Report

Thermal Injury to Skin and Abdominal Wall Structures During HIFU Ablation of Uterine Fibroids: Three Cases

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Uterine fibroids are common and benign gynecological tumors. Treatment options include surgery, medication, uterine arterial embolization (UAE), and high-intensity focused ultrasound (HIFU) ablation. HIFU has the advantage of being non-invasive. It also does not cause tissue adhesion or bleeding. However, during the treatment course, hyperthermia, cavitation, and mechanical effects may induce tissue necrosis at the focal point and tissue damage within the beam path. HIFU has been used extensively for the treatment of uterine fibroids in recent years, but few reports have been published on the complications of skin burns. We report three cases of skin burns after HIFU ablation and analyze the possible causes.

Keywords: HIFU, high-intensity focused ultrasound ablation, uterine fibroid, thermal injury, uterine arterial embolization

1. Introduction

Uterine fibroids, benign monoclonal tumors of the myometrium, are remarkably common in women of reproductive age. Some women with fibroids are asymptomatic, while others experience heavy menstrual bleeding, symptoms related to bladder function, constipation, or pelvic pain. In serious cases, surgical intervention is required [1]. Women with fertility concern may opt for myomectomy, which preserves the uterus, but carries the risk of complications including hemorrhage and adhesion [2][3]. High-intensity focused ultrasound ablation (HIFU) is a noninvasive technique that causes instant coagulative necrosis of the target tissue [4]. Wang et al. have demonstrated the safety and effectivity of HIFU in treating uterine fibroids [5].

However, adverse reactions have been reported including thermal injury to the abdominal skin, lower abdominal pain, lower limb deep vein thrombosis, and neurotoxicity of sacral plexus [6]. We present three cases of skin burns after HIFU ablation and analyze the possible causes.

2. Case report

Case 1

A 56-year-old woman with uterine myomas received regular follow-up for more than 10 years and underwent HIFU on January 5, 2018 due to enlarged myomas. On MRI, there were six uterine myomas, the largest of which measured 10.8 x 8.3 cm (Fig.1). The length of treatment was 2,866 sec. During the procedure, she complained of abdominal pain and burning sensation on the abdominal skin. After operation, one 0.5 x 0.5 cm blister around umbilicus was noted (Fig.2). We prescribed Cephalexin 250mg/cap QID for wound infection prevention and Fusidic acid cream for topical use.

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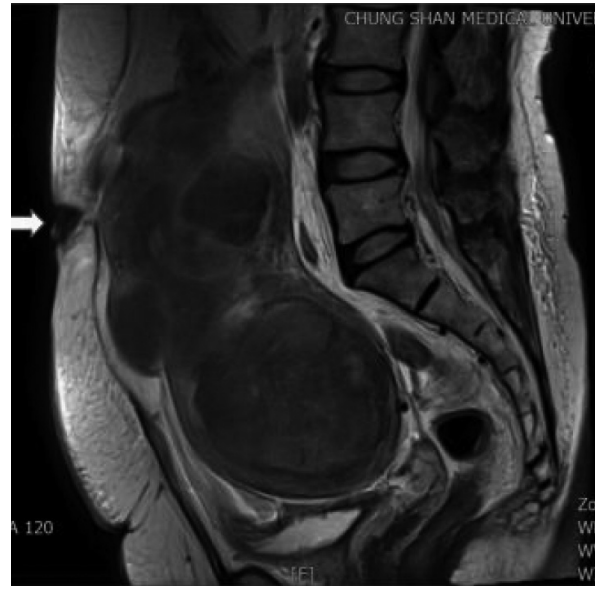
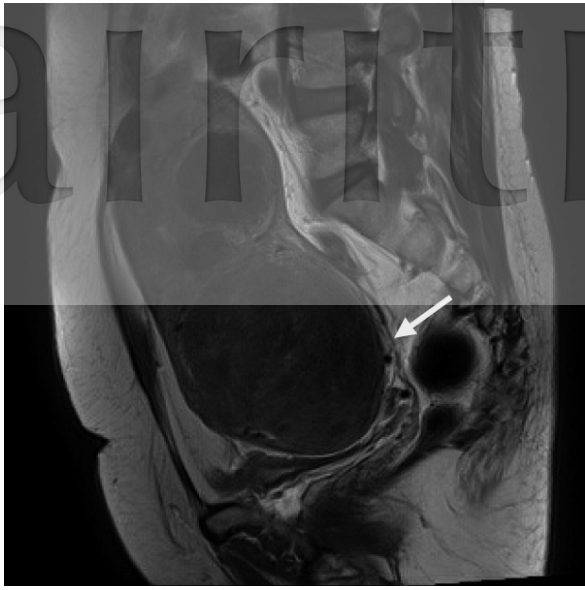


Fig. 1 T2-weighted MRI before HIFU treatment shows the largest myoma, measuring 10.8 x 8.3 cm (red arrow) (a). There was reduced distance between the enlarged uterus and the umbilicus (white arrow) (b).



Fig. 2 After HIFU treatment, one 0.5 x 0.5 cm blister around the umbilicus was noted (arrow).

This patient was found to have fully recovered on OPD follow-up exam.

Case 2

A 42-year-old woman was diagnosed with uterine myomas and received initial round of HIFU in 2015. However, she complained of irregular menstrual cycle and frequent urination and decided to undergo a second round of HIFU. Pre-procedure MRI showed five myomas, the largest of which measured 9.0 x 6.7 cm (Fig.3). HIFU was performed on February 14, 2018 for 1,408 sec. During the procedure, she complained of abdominal pain and burning sensation on the abdominal skin. After the procedure, two 0.5 x 1 cm blisters were noted (Fig.4). We prescribed Cephalexin 250mg/cap TID for wound infection prevention. This patient was found to have fully recovered on OPD follow-up exam.

Case 3

A 47-year-old woman underwent initial course of HIFU in 2017 for adenomyosis and uterine myomas with hypermenorrhea. However, she presented with recurrent menorrhagia, hypermenorrhea, and dysmenorrhea, in addition to constipation, dizziness, and backache. She decided to undergo a second round of HIFU for symptom relief. Pre-procedure MRI showed one uterine myoma measuring 11.1 x 4.3 cm (Fig.5). HIFU was performed on August 2, 2019 and lasted 1,408 sec. During the procedure, she complained of abdominal skin pain and burning

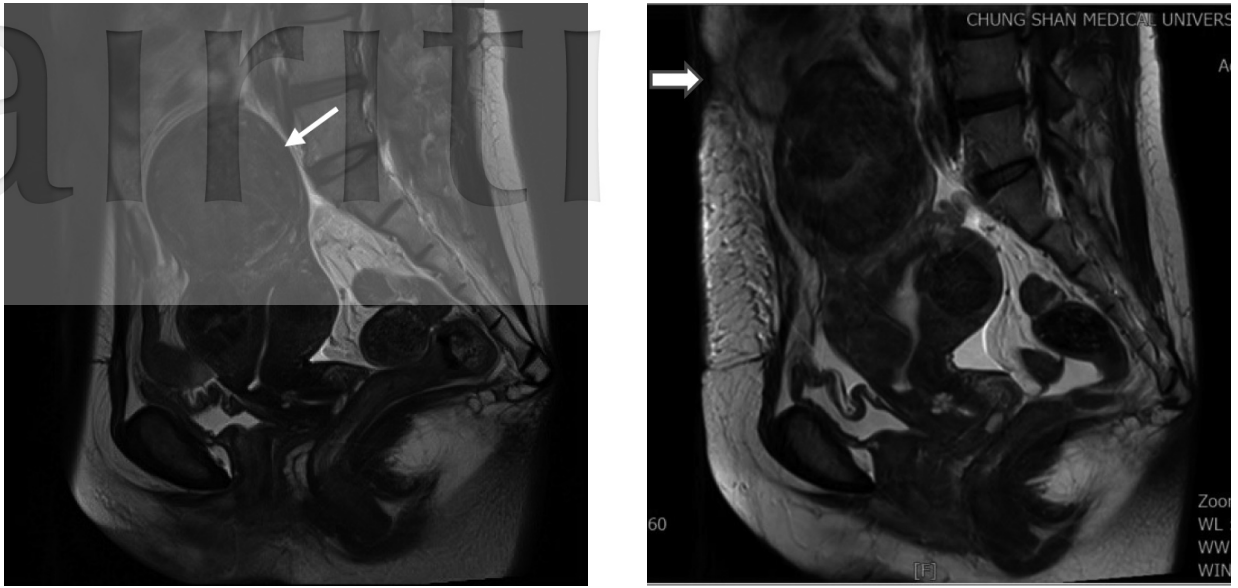


Fig. 3 T2-weighted MRI before HIFU treatment shows the largest myoma, measuring 9.0 x 6.7 cm (red arrow) (a). The enlarged uterus was near the umbilicus (white arrow) (b).

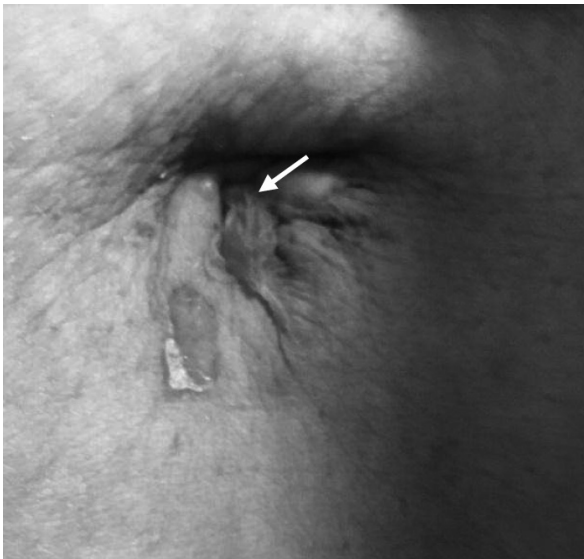


Fig. 4 After HIFU treatment, two 0.5 x 1 cm blisters were noted (arrows).

sensation. Following the procedure, three small vesicles were noted on the abdominal skin (Fig.6). We prescribed Fusidic acid cream for wound care. This patient was found to have fully recovered on OPD follow-up exam.

3. Discussion

During HIFU ablation for uterine fibroids, the temperature at the focus can reach 60–100°C [7]

and tissue damage along the beam path is possible. Burns on the abdominal skin mostly occur in the umbilical area and on scars and striae gravidarum [8]. Chen et al. [4] reported blisters or burns on the skin of the abdomen in 0.26% of patients after HIFU ablation.

Burns are related to the length of treatment [9] [10]. The longer the treatment time, the higher the incidence of skin blisters in the surgical area. One study demonstrated that non-thermal effects play a role [9]. These mainly refer to the cavitation and mechanical effects of ultrasound waves. The cavitation effect may lead to damage to tissues and organs containing certain microbubbles, while mechanical effects may amplify the inflammatory response of local tissues and cause or worsen pain. In order to prevent burns on the skin, adequate skin preparation is important. The skin must be thoroughly degreased and degassed [6] and scars and striae gravidarum avoided during the procedure [10].

4. Conclusion

In all three cases, treatment times were long, as the fibroids were large. Moreover, these fibroids were located close to the umbilicus and burns on the skin in that area developed due to the cavitation



Fig. 5 Pre-procedure MRI shows one uterine myoma measuring 11.1 x 4.3 cm (red arrow). There was reduced distance between the enlarged uterus and the umbilicus (white arrow) (b).

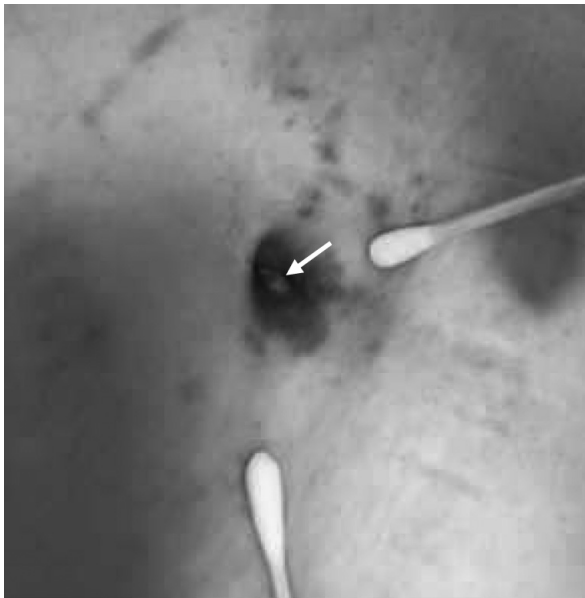


Fig. 6 After HIFU treatment, three small vesicles were noted on abdominal skin (arrow).

effect. According to the SIR classification system, these three adverse reactions were of Class B. After appropriate treatment, the patients recovered well.

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