



---

**Research Article**

## **The Application Value and Clinical Experience of Minimally Invasive Interventional Therapy in the Diagnosis and Treatment of Advanced Breast Cancer (Ulcerative Type)**

**Fa-zhan Zhou<sup>1,2,#,\*</sup>, Zhou Xing<sup>3,#</sup>, Shi-qiang Nie<sup>1</sup>, Jian Niu<sup>1</sup>, Peng-sheng Wang<sup>1</sup>, Feng-zhong Jin<sup>1</sup>**

<sup>1</sup>Department of Interventional Therapy, Jinan Fuda Tumor Hospital, 8 Shengchan Road, Tianqiao District, Jinan City, Shandong Province 434023, PR China; <sup>2</sup>Department of Clinical Medicine, College of Medical Sciences, Jiangsu University, 301 Xuefu Road, Jingkou District, Zhenjiang City, Jiangsu Province 212013, PR China; <sup>3</sup>First Clinical College, Guangdong Medical University, Zhanjiang City, Guangdong 524400, PR China.

**#, These authors contributed equally to this work.**

**\*, Correspondence**

Fa-zhan Zhou, Department of Interventional Therapy, Jinan Fuda Tumor Hospital, 8 Shengchan Road, Tianqiao District, Jinan City, Shandong Province 434023, PR China. Email: [niujiang0704@qq.com](mailto:niujiang0704@qq.com).

**Received:** April 10, 2025; **Accepted:** December 22, 2025; **Published online:** August 2, 2026.

**Cite this paper:** Fa-zhan Zhou, Zhou Xing, Shi-qiang Nie, Jian Niu, Peng-sheng Wang, Feng-zhong Jin. (2026) The Application Value and Clinical Experience of Minimally Invasive Interventional Therapy in the Diagnosis and Treatment of Advanced Breast Cancer (Ulcerative Type). *Global Journal of Medicine*, 6(1):1-9.

<http://naturescholars.com/gjm.060101>. <https://doi.org/10.46633/gjm.060101>.

**Copyright© 2026** by Scholars Publishing, LLC.

---

### **Abstract**

This study investigated the application value of multidisciplinary comprehensive therapy in advanced breast cancer. In 2021-2025, 4 patients with breast cancer in the late stage were taken and implanted with a comprehensive therapeutic regimen including transcatheter arterial chemoembolization (TACE), microwave ablation, radioactive particle implantation, and palliative surgery. The results showed that the tumor volume and intensity of the patients were significantly reduced in the imaging examination, local symptoms and the quality of life were greatly improved, the pain is reduced, the ability of daily living is enhanced. Our study demonstrated that the multidisciplinary comprehensive treatment provides a new treatment option for advanced breast cancer patients, which has important clinical significance.

**Key words:** Advanced breast cancer (ulcerative); Minimally invasive intervention; Arterial infusion chemotherapy + Embolization; Microwave ablation; I125 particle implantation.

---

### **Introduction**

Breast cancer is one of the most common malignant tumors among women globally, with its incidence

increasing annually, posing a significant threat to women's health. Advanced breast cancer, particularly locally advanced breast cancer (LABC), presents high treatment difficulty due to substantial

tumor burden and complex disease conditions. Traditional treatment modalities include surgery, chemotherapy, radiotherapy, endocrine therapy, and targeted therapy, yet single-modality approaches often fail to achieve optimal outcomes. In recent years, multidisciplinary comprehensive therapy has emerged as a critical treatment paradigm for advanced breast cancer. The combined application of multiple therapeutic strategies enabled better tumor control, improved quality of life, and enhanced prognosis for patients.

## Methods

### 1. Transcatheter arterial chemoembolization (TACE).

TACE is a catheter-based technique that delivers chemotherapeutic agents directly into the tumor's blood supply arteries under medical imaging guidance, while simultaneously using embolic agents to block tumor blood supply. This approach significantly enhances local drug concentration in tumors, reduces systemic toxicity, and achieves high local control rates [1]. It is effective for solid tumors with well-defined blood supply arteries, rich vascular networks, and sensitivity to chemotherapeutic agents. Commonly used drugs include anthracyclines, taxanes, and platinum-based agents. Selective infusion can be performed based on tumor blood supply characteristics to improve treatment precision.

Compared with microwave ablation and radioactive seed implantation, TACE can cover multifocal and infiltrative lesions through the vascular pathway, effectively controlling exudation and bleeding; however, its efficacy is highly dependent on tumor blood supply, and its effectiveness is limited in hypovascular or extensively necrotic areas. Compared with palliative surgery, TACE is less invasive and repeatable, but a single treatment session is unlikely to rapidly relieve the mass effect of a large tumor, and it carries the risks of chemoresistance and vascular injury.

### 2. Microwave Ablation

Microwave ablation utilizes high-frequency electromagnetic waves to induce high-speed motion of polar molecules within tumor tissues under microwave field, generating frictional heat that elevates local temperature to 60-100°C, leading to coagulative necrosis of tumor cells. This method offers advantages such as consistent temperature control, large ablation area, short treatment duration, low postoperative pain response, minimal damage, high tolerance, repeatability, and a low incidence of complications. It is particularly suitable for tumor lesions with a diameter  $\leq 4$ cm.

Microwave ablation is not restricted by tumor blood supply; the ablation zone is precise and controllable, immediate inactivation is definitive, and thermal efficiency is high. However, compared with TACE, it tends to leave residual tumor in diffuse tumors with ill-defined borders. Compared with radioactive seed implantation, microwave ablation has limited coverage in a single session and carries a higher risk of thermal injury to adjacent vital structures (e.g., skin and chest wall). Compared with palliative surgery, it is less invasive but cannot repair large skin defects in a single procedure.

### 3. Radioactive Particle Implantation

Radioactive particles implantation employs interventional techniques to precisely deliver radioactive seeds into tumor tissues under imaging guidance, utilizing the continuously emitted low-energy radiation to destroy tumor cells [2]. I125 radioactive particles are widely used due to their long half-life, low energy, short irradiation distance, and ease of storage. This method achieves high conformity between the target area and the tumor shape, effectively increasing local dose while protecting surrounding normal tissues.

The advantage of particle implantation lies in its continuous low-dose irradiation, which can cover sub-clinical lesions, causes minimal damage to surrounding normal tissues, and offers the best conformality. However, compared with the immediate ablation achieved by microwave ablation

and the rapid tumor shrinkage seen with TACE, particle implantation has a relatively slow onset of action, entails radiation protection requirements, and carries a risk of particle migration. Compared with palliative surgery, it can preserve the external contour of the organ, but ulcerated wounds require prior debridement and infection control.

#### 4. Palliative surgery

Palliative surgery is an important therapeutic approach for locally advanced breast cancer, primarily aimed at reducing tumor burden, excising ulcerated lesions, controlling complications such as hemorrhage and infection, and alleviating local symptoms [3]. Surgical modalities include tumor resection, wound repair, and skin flap transplantation. Surgical intervention can significantly improve patients' quality of life and create conditions for subsequent treatments.

Surgery can resect large areas of necrotic and ulcerated tissue in a single procedure and directly repair the wound, providing the most powerful immediate relief of suffering. However, compared with the other three minimally invasive modalities, surgery is more traumatic, imposes higher demands on the patient's general condition, requires a longer postoperative recovery, and may be less delicate than particle implantation in managing extensive resection margins. Therefore, surgery often needs to be performed sequentially after effective interventional therapy has improved both systemic and local conditions.

## Results

This study analyzed 4 cases of locally advanced breast cancer patients admitted between 2023 and 2025. All patients were female, aged 33-73 years. These patients had already presented with significant local progression and symptoms at their initial consultation.

#### 1. Baseline feature

Case 1 was a 73-year-old patient who discovered a left breast mass in December 2017. The initial tumor size was approximately 3cm×3cm. After various non-standardized treatments, the disease progressed, presenting with skin ulceration, foul odor, exudation, and bleeding. She was admitted to our hospital in September 2024 and diagnosed with left breast malignant tumor pT4bN2M1 stage IV. The central breast and skin of the left breast were absent, forming a cavity. The pectoralis major muscle was visible, along with grayish-yellow and black necrotic tissue, a foul odor, and moderate anemia.

Case 2 was a 33-year-old unmarried patient who self-detected a left breast mass approximately 2cm×2cm in August 2021. Without standardized diagnosis and treatment, the condition continued to deteriorate, manifesting as skin erythema, peau d'orange sign, ulceration, bleeding, and purulent discharge. The patient visited our hospital in February 2023 and was diagnosed with left breast invasive carcinoma T4dN3cM0 stage IIIC, triple-negative type, with metastasis to axillary and supraclavicular lymph nodes. Upon admission, a mass measuring approximately 20.0 cm × 20.0 cm was observed in the left breast, with a cauliflower-like ulceration and copious yellowish-white exudate on the surface. Various-sized lymph nodes were palpable in the left axilla, indicating a cachectic state associated with severe anemia and hypoalbuminemia. CT revealed a large soft tissue density lesion in the left breast, with a maximum cross-sectional area of approximately 15.0 cm × 12.2 cm and heterogeneous density. Multiple lymph nodes with a short diameter of less than 1.0 cm were observed in the left axilla, accompanied by local skin discontinuity.

Case 3 was a 41-year-old patient who discovered a left breast mass in December 2021. After receiving non-standardized treatment, the condition progressed. In April 2024, the patient presented to our hospital and was confirmed to have left breast malignant tumor pT4bN2M1 stage IV. A ulcerated area measuring approximately 20.0 cm × 20.0 cm was observed in the left breast, with a

cauliflower-like surface ulceration and minimal yellowish-white discharge. The patient also presented with moderate anemia. CT revealed a large soft tissue mass in the left breast region, with a maximum cross-sectional area of approximately  $15.2\text{ cm} \times 5.6\text{ cm}$ . Multiple enlarged lymph nodes were present bilaterally, with the left axilla being more prominent.

Case 4 was a 54-year-old patient who discovered a left breast mass as early as 2014 but did not receive standardized treatment, leading to a delay of nearly ten years. At her first visit to our hospital in December 2024, a massive ulcerated wound measuring approximately  $20.0\text{ cm} \times 25.0\text{ cm}$  was present, with a locally cauliflower-like ulcerated surface, a small amount of yellow-white discharge, accompanied by noticeable foul odor and exudation, and mild anemia. CT showed irregular nodular or mass-like soft tissue density in the left breast, with an irregular morphology and indistinct borders. Localized skin thickening and ulceration were noted. Multiple enlarged lymph nodes were present in the left axilla, some of which had indistinct boundaries with the breast lesion.

## 2. Treatment Process

The 4 patients with locally advanced breast cancer were treated with a multidisciplinary comprehensive therapy regimen, which included transcatheter arterial chemoembolization, microwave ablation, radioactive particle implantation, and skin flap transplantation. For the transcatheter arterial chemoembolization, intracoronary infusion of albumin-bound paclitaxel and epirubicin hydrochloride was performed during each procedure, along with embolization of tumor-supplying arteries, including the left internal and external thoracic arteries, left superior thoracic artery, thoracopleural artery, and subscapular artery. The 4 patients received varying numbers of cycles of transcatheter arterial chemoembolization combined with microwave ablation and radioactive particle implantation based on their specific conditions and disease progression. Depending on tumor size, 25 to

115 radioactive I125 particles with an activity of 0.6 mCi were implanted. One case underwent skin flap transplantation, which demonstrated favorable postoperative outcomes. Concurrently, supportive measures were actively implemented during treatment, including albumin supplementation, red blood cell transfusion, hematopoietic support, and antibiotic therapy for infection control. Regular wound dressing changes were performed at ulcerated sites, and intratumoral effusions were promptly drained.

## 3. Short-term therapeutic efficacy

After minimally invasive combined therapy, all four patients achieved significant short-term therapeutic outcomes (Figure 1). Case 1 exhibited tumor tissue detachment after only 2 treatment cycles, with complete tumor resolution after 4 cycles. The local ulcer area in the left breast had largely healed, with visible fresh granulation tissue. Follow-up CT revealed disappearance of subcutaneous soft tissue nodules and partial reduction of bilateral axillary lymph node metastases. In Case 2, the ulcer area decreased significantly from  $20\text{ cm} \times 20\text{ cm}$  to approximately  $5\text{ cm} \times 4\text{ cm}$ , with effective control of local symptoms. Wound exudate markedly reduced, foul odor disappeared, and local infection was effectively controlled. Skin color improved markedly, tissue texture softened, and skin flap transplantation achieved complete graft survival. Infection symptoms resolved, skin color normalized, and no significant exudate was observed. Tumor marker levels declined significantly, and anemia with hypoalbuminemia showed marked improvement. In Case 3, systematic treatment led to gradual wound healing, with the ulcer area reduced to  $5.0\text{ cm} \times 2.0\text{ cm}$ . No obvious bleeding points or foul odor were detected, and fresh granulation tissue formed. PET-CT demonstrated no biological activity of tumor cells. Follow-up CT showed reduction of bilateral axillary lymph node metastases. In Case 4, the ulcer area decreased from  $20\text{ cm} \times 25\text{ cm}$  to approximately  $6\text{ cm} \times 6\text{ cm}$ . Yellowish-white exudate significantly decreased, fresh granulation

tissue formed, and foul odor completely disappeared. The local wound surface was clean, exudate markedly reduced, borders were well-defined, and no redness or swelling was observed. Surrounding tissue texture improved significantly.

#### 4. Imaging Changes

After minimally invasive interventional comprehensive therapy, imaging examinations of all 4 patients demonstrated significant improvement (Figure 1). Regarding the primary breast lesions, CT scans revealed marked reduction in tumor volume compared to pre-treatment levels, with some lesions shrinking by over 50% or even completely disappearing. The tumor density was significantly decreased, and large areas of hypodensity were observed within the tumors, indicating necrotic tumor tissue. Boundaries became clearer compared to before, and microwave ablation areas exhibited typical round hypodense changes. For lymph node metastases, axillary and supraclavicular lymph nodes showed significant shrinkage and reduced density compared to pre-treatment. Some lymph nodes transitioned from clustered to scattered states, suggesting a marked reduction in tumor burden and less edema in surrounding tissues. Local subcutaneous soft tissue changes were notable, with significant improvement in edema compared to pre-treatment. Skin thickening was reduced, and the boundaries with deep tissues became clearer. Local vascular imaging improved. The radioactive seed implantation areas demonstrated uniform distribution of I125 particles and significant density changes in surrounding tissues, indicating effective radioactive seed therapy. Some areas showed distinct hypodense shadows, suggesting local tissue necrosis.

#### 5. Quality of Life

Comprehensive minimally invasive interventional therapy significantly improved patients' overall quality of life. In terms of pain control, the pain intensity of patients was markedly reduced from moderate or severe (pain score 6-8) before treatment

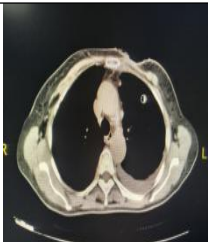
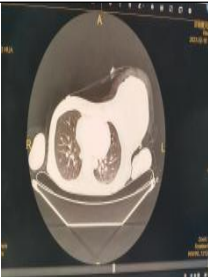
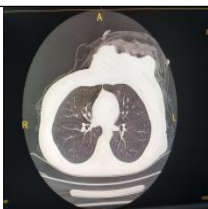
to mild or no pain (pain score 0-3), with a substantial decrease in analgesic medication usage, and some patients have discontinued analgesics. Regarding complication control, bleeding symptoms were effectively managed, wound exudate volume was significantly reduced, local infection symptoms disappeared, and malodor was markedly improved. The frequency of dressing changes decreased from 2-3 times daily to once daily, reducing the difficulty of wound care. In terms of daily living ability, patients' KPS scores improved significantly from 40-60 before treatment to 70-90, enabling basic self-care for daily activities. Sleep quality was notably enhanced, appetite increased, and body weight gradually recovered. Anemia and hypoalbuminemia symptoms improved, and mental status showed marked improvement compared to before. Social activity capacity was elevated, and confidence in disease treatment increased, leading to a significant overall improvement in quality of life.

#### Discussion

Breast cancer is the most common malignant tumor and the leading cause of cancer-related mortality in women worldwide (1-3). Although breast cancer is relatively sensitive to targeted therapy and chemotherapy, some advanced cases develop drug resistance to multiple agents after multiple cycles of targeted therapy and polychemotherapy. The progressive tumor growth leads to skin ulceration, resulting in significant exudation, infection, hemorrhage, and foul odor, accompanied by severe anemia. Even frequent changes of wound dressings fail to alleviate exudation and malodor, severely compromising patients' quality of life.

The principle of radiofrequency ablation involves the insertion of a radiofrequency ablation probe (electrode) carrying high-frequency alternating current into the target tumor tissue under ultrasound guidance, while another electrode is injected subcutaneously with glucose solution in other parts of the body. The diffusion electrode forms a circuit, with the radiofrequency current



| Time   | Before therapy                                                                      |                                                                                     | After therapy                                                                        |                                                                                       |
|--------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Result | Clinical Signs                                                                      | Imaging data                                                                        | Clinical Signs                                                                       | Imaging data                                                                          |
| Case 1 |    |    |    |    |
| Case 2 |    |    |    |    |
| Case 3 |   |   |   |   |
| Case 4 |  |  |  |  |

**Figure 1. Patient clinical signs and imaging data before and after therapy.**

ranging from approximately 460 to 500 kHz. Ions and electrons in the surrounding tissues are excited by the alternating current, generating "ion oscillation" that produces substantial thermal energy, leading to a sharp increase in tumor tissue temperature. This results in rapid dehydration and denaturation of proteins within the tumor tissue. The extent of cancer tissue destruction primarily depends on temperature: at 42°C, cell denaturation and death occur within approximately 50 hours. When the temperature rises to 45–50°C, cell death increases exponentially within 5 minutes. Beyond 60°C, surrounding tissues

undergo rapid coagulative necrosis (4). Simultaneously, physiological regulation of neovascularization in the tumor is disrupted, blocking blood and oxygen supply to the tumor. Thus, radiofrequency ablation not only directly kills tumor cells but also further eliminates them by disrupting the tumor's cellular blood supply. In addition to heating, radiofrequency ablation can also cool the target tumor to the freezing point, thereby killing tumor cells. In a Phase I study conducted at 16 independent medical institutions, radiofrequency ablation was performed on 292 patients with tumors

less than 2 cm in diameter, followed by delayed surgical resection. Histopathological results confirmed an ablation rate of 63%–100%, with an average of 90%. Radiofrequency ablation (RFA) without surgical resection, i.e. RFA alone without tumor excision, combined with adjuvant radiotherapy and endocrine therapy, is primarily used for elderly breast cancer patients who are intolerant to surgery. A relevant study randomized 40 patients with breast invasive ductal carcinoma  $\leq 2$  cm (age 46–86 years, mean 64 years) into two groups: RFA alone and tumor resection, with 20 cases in each group. The mean follow-up was 25 months (range 1–83 months). No patients experienced recurrence or required reoperation. Surgical margins were assessed using NADH and CK18 staining. In the tumor resection group, 11 cases (55%) and in the RFA group, 4 cases (20%) showed positive margins, significantly higher than in the RFA group ( $P=0.02$ ) (5). Two possible reasons may explain this: ① The RFA needle must be placed deep within the tumor or at the breast-tumor interface, ablation is performed from deep to superficial, typically extending 5 mm beyond the tumor margin to ensure complete coverage. Notably, one patient with positive margins after resection underwent local ablation, and postoperative follow-up showed no local or systemic recurrence. Ultrasound-guided RFA tends to remove more tumor tissue than resection. ② RFA is more likely to achieve tumor-free margins compared to resection due to longer operative time, which may compromise the surgical field and, to some extent, affect complete tumor excision (6).

I-125 seeds interfere with the DNA synthesis phase and mitosis of tumor cells through the continuous low-energy gamma rays they emit, belonging to the category of internal radiotherapy. Their range is only 1.7 cm, characterized by a high dose in local tumor tissue and a low dose in normal tissue, which can improve tumor treatment rates while causing minimal damage to normal tissue. Furthermore, their long half-life, approximately 59 d, allows for a sustained effect throughout the entire tumor cell cycle (7).

These unique properties make radioactive particles particularly effective for malignant tumors. I-125 seeds not only target breast cancer cells but also stimulate immune cells to eliminate metastatic lesions. As a minimally invasive and safe treatment, I-125 implantation demonstrates remarkable local control in breast cancer, making it clinically viable—though systemic therapy should be considered concurrently.

Approximately 2-3 days after local modification of TACE, changes in the local chest wall skin, axillary lymph node edema, microcirculatory embolism, tumor edema, and shrinkage may occur. These changes suggest that vascular spasm and endothelial cell damage may be induced by direct stimulation of microvessels by local gelatin sponge embolization or high-concentration chemotherapeutic agents, leading to reduced blood flow and insufficient perfusion in the tumor-affected area, resulting in tumor tissue deformation and necrosis. The pathological morphological changes can be divided into three stages: Stage I (Degenerative degeneration Stage): The main manifestations include varying degrees of degeneration of cancer cells, with cytoplasmic swelling, loosening, and formation of vacuoles of varying sizes, as well as hypertrophy, hyperchromia, or shrinkage of nuclei, followed by dissolution and fragmentation. Stage II (Granulomatous Stage): Cancer cells undergo further degeneration or even necrosis, with a reduction in their number and proliferation of fibrous stromal tissue. Granulation tissue invades the cancer nests, and the surrounding areas of degenerated cancer nests are infiltrated by numerous phagocytes and lymphocytes. Stage III (Fibrotic Stage): Cancer cells are significantly reduced, showing high degeneration, necrosis, or disappearance, with marked increase in fibrous stromal tissue and fibrosis, and even replacement of the necrotic areas by scar tissue. Arterial embolization induces localized hemodynamic changes, significantly reducing both arterial and venous pressures. This effectively improves exudation, reduces skin edema and tension, and

alleviates pain caused by excessive skin traction in the breast area. The decreased pressure in the tumor region partially eliminates the primary driving force for metastasis, thereby reducing metastatic risk. Currently, arterial perfusion combined with embolization is a widely adopted clinical treatment approach, offering advantages such as ease of physician operation and reduced patient bleeding (8). Current statistics indicate that this combined therapy demonstrates proven efficacy with minimal intraoperative and postoperative adverse reactions.

Minimally invasive interventional therapy has demonstrated significant advantages in the diagnosis and treatment of advanced breast cancer. TACE precisely enhances local drug concentration, microwave ablation and radioactive particle implantation deliver targeted tumor ablation, while palliative surgery effectively alleviates symptoms. The synergistic effects of these modalities significantly improve patient prognosis. However, challenges remain in this treatment approach, such as high treatment costs and stringent technical requirements. Future efforts should focus on optimizing treatment protocols, exploring personalized therapeutic models, strengthening multidisciplinary team collaboration, and enhancing the technical capabilities of primary healthcare institutions to benefit more patients, prolong survival, and improve quality of life.

## Declarations

### 1. Consent to publication

All authors agreed to publish the manuscript at this journal based on the signed Copyright Transfer Agreement, and followed publication ethics.

### 2. Ethical approval and consent to participants

Ethical approval and consent to participants were obtained from our hospital and the patients, respectively.

### 3. Disclosure of conflict of interests

We declare that no conflict of interest exists.

### 4. Funding

None.

### 5. Availability of data and material

Our data used to support the findings of this study are all included within the article.

### 6. Authors' Contributions

Authors contributed to this paper with data collection (FZZ, SQN, JN, PSW, FZJ), writing (FZZ, ZX, SQN, JN, PSW, FZJ), revision (FZZ, ZX, SQN, JN, PSW, FZJ), editing (FZZ, ZX, SQN, JN, PSW, FZJ) and final approval (FZZ).

### 7. Acknowledgement

None.

## References

1. Xiang-yu Liu, Rui Xia, Si Huang, et al. Anesthetic Management for Radical Mastectomy in a Patient During the Third Trimester of Pregnancy: A Case Report. *Chinese Journal of Anesthesiology*. 2022;42(1):2-3. (in Chinese)
2. Qin-wen Qin, Tong Tang, Wen-jun Jia. Neoadjuvant chemotherapy for locally advanced inflammatory breast cancer: a case report. *Chinese Journal of Clinical Case Reports Database*. 2024;6(1):8-9. (in Chinese)
3. Li-min Niu, Hui-min Lü, Meng-wei Zhang, et al. Long-term survival of advanced breast cancer with an intensive plus maintenance treatment strategy: a case report. *Chinese Journal of Clinical Case Reports Database*. 2022;4(1):4-5. (in Chinese)
4. Hai-yang Liu, Jun-ting Mu, Zhong-liang Wu, et al. Efficacy of radiofrequency ablation for hyperplastic breast nodules and its effect on immune function. *Hebei Medical Journal*. 2018;40(20):3101-3104. (in Chinese)
5. Xiao Y, Zhang B, Wu Y. Retraction Note to: Radiofrequency ablation versus hepatic resection for breast cancer liver metastasis: a systematic review and meta-analysis. *J Zhejiang Univ Sci B*. 2022;23(6):528.
6. Yamamoto N, Fujimoto H, Nakamura R, et al.



Pilot study of radiofrequency ablation therapy without surgical excision for T1 breast cancer:evaluation with MRI and vacuum-assisted core needle biopsy and safety management. *Breast Cancer*, 2011;18(1):3-9.

7. Yi-ming Zeng, Yan-ping Lin. Local treatment of bronchial lung cancer with radioactive 125I seed implantation. *Journal of Shandong University (Health Sciences)*. 2017;55(4):1-6. (in Chinese)
8. Yan-shou Zhang, Yun-jiang Liu. Review and progress in surgical treatment of breast cancer. *Journal of Modern Oncology*. 2015;(5):719-723. (in Chinese)