

Case Research

A modified radiofrequency ablation approach for treating distant lymph node metastasis in two patients with late-stage cancer

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Abstract

Patients with late-stage cancer commonly have distant lymph node metastasis; however, poor health often contraindicates surgical treatment. Although the quality of life and overall survival for these patients are low, there is neither a consensus nor a guide for treatment. Ablation technique and surrounding tissue damage are two possible reasons for limited study of radiofrequency ablation in patients with superficial distant lymph node metastasis. Here, we report two patients treated successfully with ultrasound-guided radiofrequency ablation for superficial distant lymph node metastasis. In these patients, deionized water was injected to the surrounding tissues of the lymph node to decrease heat injury. Results from these patients suggest that radiofrequency ablation may play an important role in the treatment of patients with distant lymph node metastasis.

Key words Radiofrequency ablation, lymph node metastasis, ultrasound-guided treatment, safety, efficacy

Distant lymph node metastasis is still regarded as a common event in patients with advanced cancer^[1,2]. Patients with distant lymph node metastasis are often treated with systemic chemotherapy or local radiotherapy, whereas radiofrequency ablation is rarely applied. There are two possible reasons for limited study of radiofrequency ablation in patients with superficial distant lymph node metastasis: (1) the technique of small lymph node ablation is difficult to handle and (2) radiofrequency ablation may cause collateral damage to adjacent structures. Thus, the outcome of radiofrequency ablation for patients with superficial distant lymph node metastasis is usually unsatisfactory. In this study, we aimed to find an available and effective method of treatment for these patients. We treated two patients with distant lymph node metastasis with modified radiofrequency ablation at Sun Yat-sen University Cancer Center. Upon follow-up, both showed complete necrosis of the metastatic lesions. Here, we share our experience with radiofrequency therapy for distant lymph node metastasis.

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Case Description

Case 1

A 58-year-old man was admitted in August 2011 with a 2-month history of progressive pain of the right lower limb. One year prior, he was diagnosed with stage T3N1M0 nasopharyngeal carcinoma (NPC) according to the Union for International Cancer Control (UICC, 2009) classification and treated with radical radiotherapy (70 Gy in 35 fractions, 5 fractions per week) combined with 3 courses of concurrent cisplatin chemotherapy. During physical examination, a tender, unfixed lymph node measuring 1.0 cm × 1.0 cm × 0.9 cm could be palpated in level III of the right cervicum, and this finding was confirmed by ultrasonography (**Figure 1**). The skin of the cervical region was normal in appearance, and no lesions were found in the oral cavity. No facial nerve palsy was present. During the course of the disease, there were no reports of headache, diplopia, abnormal deglutition, nasal occlusion, or blood-stained nasal discharge. Emission computed tomography (ECT) and magnetic resonance imaging (MRI) scans revealed metastasis from NPC to the lumbar vertebra 2/3 and a single lymph node in level III of the right cervical region. Laboratory studies, which included full blood cell count, electrolytes, urinalysis, and liver function tests, showed results within normal limits.

According to the presentation, physical examination, and laboratory examination, this patient was diagnosed, after radiotherapy, with NPC with metastasis to the lumbar vertebra and a single lymph node in level III of the right cervical region. The patient

was unwilling to undergo radiotherapy again and instead was treated with palliative radiotherapy for metastasis in the lumbar vertebra and radiofrequency ablation for lymph node metastasis in the right cervical region. This patient did not undergo radiotherapy for the right cervical lymph node because of local radiation-induced injury from the treatment of primary NPC. Thus, this patient underwent a radiofrequency ablation treatment to destruct the right cervical lymph node.

The patient achieved clinical complete response after 1 month of treatment. The follow-up protocol included clinical and laboratory examinations every 3 months in the first year after therapy and every 6 months thereafter. The patient was in good condition at the last follow-up in February 2012 and was living a normal life.

Case 2

A 57-year-old woman presented with metastasis of esophageal carcinoma after chemoradiotherapy. She was previously diagnosed with stage T3N1M0 esophageal carcinoma (UICC 2009) in 2010 and underwent radical radiotherapy (60 Gy in 30 fractions, 5 fractions per week) with 4 courses of synchronous chemotherapy (5-fluorouracil plus cisplatin). Positron emission tomography/computed tomography (PET/CT) scan showed signs of primary local advance and solitary metastasis in the right supraclavicular lymph node in April 2011. Ultrasound revealed the lymph node was 2.6 cm × 1.4 cm × 1.2 cm (Figure 2).

The patient refused to undergo radiotherapy for the right supraclavicular lymph node because of the severe adverse effects of previous radiotherapy. Subsequently, the patient underwent systemic chemotherapy (5-fluorouracil plus cisplatin) for local esophageal carcinoma and radiofrequency ablation for the right supraclavicular lymph node. This patient underwent a radiofrequency ablation treatment to destruct the right supraclavicular lymph node. The follow-up protocol was the same as that for case 1. After 1

month of radiofrequency, the right supraclavicular lymph node was not enhanced on contrast-enhanced CT scans, but the local lesion had advanced. Hence, gemcitabine was added to control the local progressive primary disease. At the last follow-up in February 2012, the patient was in good condition, and there was no evidence that distant lymph node metastasis had recurred.

Discussion

Patients with advanced cancer have the risk of local recurrence and distant metastasis. For treating distant lymph node metastasis, radiotherapy and chemotherapy are usually the first choices; experience with other therapies is limited. Our results suggest that radiofrequency ablation may play an essential role in treating distant lymph node metastasis. To the best of our knowledge, only two papers have been published regarding radiofrequency ablation for distant lymph node metastasis, and both focus on deep metastatic lymph nodes but not superficial distant lymph node metastasis^{3,4}. There are several possible reasons for limited studies of radiofrequency ablation in patients with superficial distant lymph node metastasis. First, radiofrequency guided by ultrasound is difficult to master; this technique requires skill and expertise, especially for treatment of small lymph nodes. Second, radiofrequency ablation may cause collateral damage to adjacent structures and pain. For these reasons, the outcome of radiofrequency ablation for patients with superficial distant lymph node metastasis is usually unsatisfactory. Thus, we modified the radiofrequency protocol and injected deionized water to separate the ablation target and surrounding tissues, which, we hypothesized, would prevent additional injury. Until recently, there were no guidelines for minimally invasive treatment for late-stage cancer patients in poor condition who could not stand additional chemotherapy or radiotherapy. In these two patients, a 22-gauge fine needle was used to puncture the surrounding tissues of the metastatic lymph node. Deionized water was injected to separate

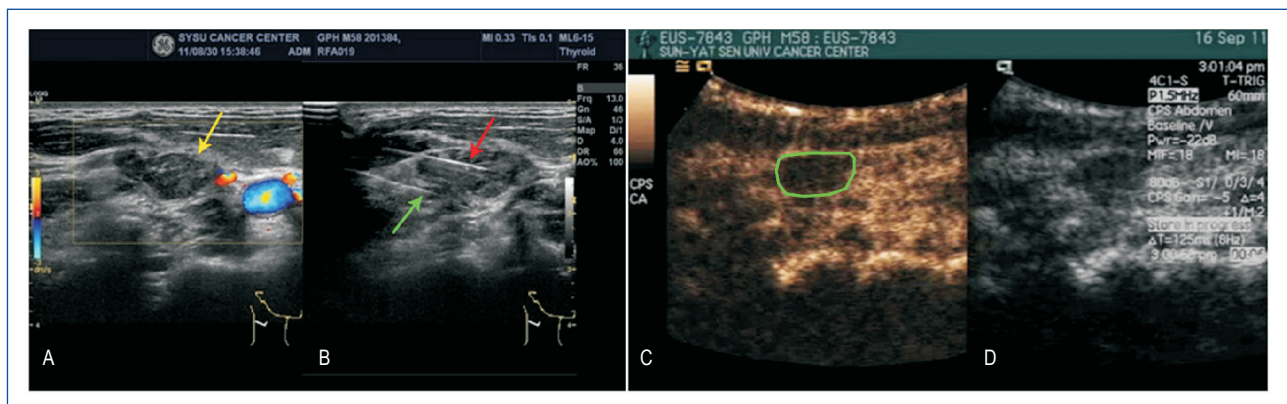


Figure 1. Radiofrequency ablation of lymph node metastasis in a 58-year-old man with nasopharyngeal carcinoma. A, ultrasound image shows lymph node metastasis. The yellow arrow indicates the enlarged lymph node. The internal jugular vein (red) is located on the inner side of the lymph node and is oppressed by the lymph node and the common carotid artery (blue). B, a radiofrequency needle was punctured into the lymph node (red arrow), and a 22-gauge percutaneous transhepatic cholangiography needle (green arrow) was punctured between the lymph node and surrounding tissues to inject deionized water. C, 1 month after the ablation, the target lymph node was not enhanced on contrast-enhanced ultrasound image (green circle). D, the general ultrasound image of image C.

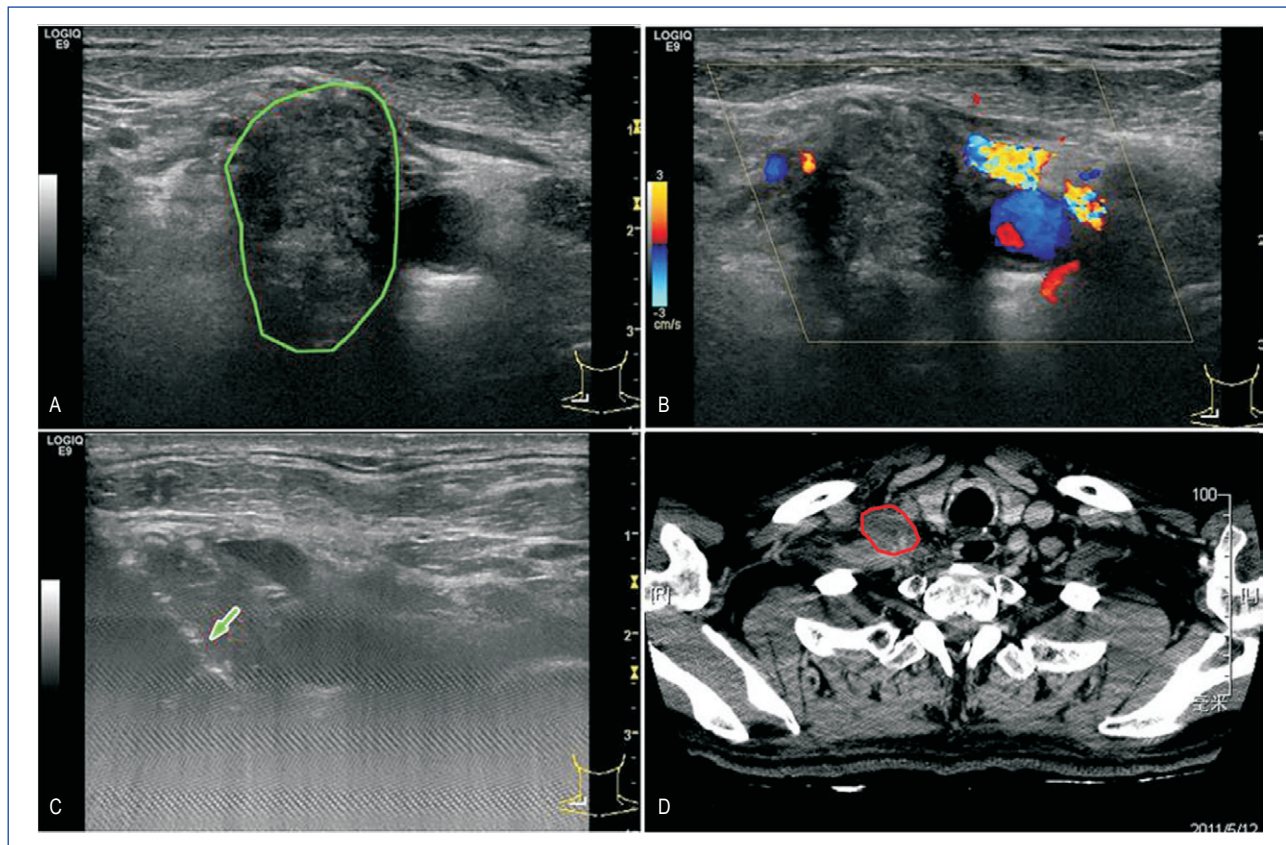


Figure 2. Radiofrequency ablation of lymph node metastasis in a 57-year-old woman with esophageal carcinoma. A, ultrasound image shows lymph node metastasis (inside the green circle). B, the internal jugular vein (mixture of yellow and blue) and the common carotid artery (blue) are located on the inner side of the lymph node. C, a radiofrequency needle (green arrow) was punctured into the lymph node. D, the treated lymph node was not enhanced on CT scan (red circle).

the ablation target and surrounding tissues until the space between them was more than 3 mm. Approximately 20 mL of water was used in each of the two patients. After injection was completed, the lymph node was surrounded by several small water pools. Indeed, both lesions were completely controlled locally and disappeared in the follow-up without any complications. Therefore, this new method provided a satisfactory outcome for the two patients.

Several researchers have proclaimed that cancer is a systemic disease, and lymph node metastasis is a small part of disease spread^[5]. Hence, regional treatment only debunks the tumor burden but does not prevent more distant spread. To date, whether lymph nodes constrain or suppress cancer cell metastasis is not clear. However, an increasing number of investigators have shown that cancer cells develop metastatic potential as tumors grow and their properties evolve^[6,7]. Thus, distant lymph node metastasis is not only an indication of changes in malignant tumor biology but also a source of local recurrence or progression. The effective of regional treatment for isolated lymph node metastasis is confuse: local control or progression?

The two primary methods of treatment for lymph node metastasis are chemotherapy and radiotherapy. Each of these therapies has

advantages and disadvantages. Chemotherapy suppresses tumor progress, but accompanying with many adverse effects, whereas radiotherapy is limited by its dose constraints. In the cases presented here, we focused on late-stage patients with distant lymph node metastasis who could not stand additional chemotherapy or radiotherapy but needed minimally invasive, yet radical treatment. Therefore, we selected ultrasound-guided radiofrequency ablation to treat these patients.

Compared with conventional curative treatment, including chemotherapy and radiotherapy, radiofrequency ablation has the following advantages as a treatment for distant lymph node metastasis: (1) it is less invasive, which is particularly important for patients unable to bear the trauma of surgery and additional radiotherapy^[8]; (2) it is cheaper and requires shorter hospitalization; (3) it can be repeated several times^[9]; and (4) it has fewer complications. Another ultrasound-guided approach for local treatment is percutaneous ethanol injection, which has a comparative effect to radiofrequency ablation. Compared with ethanol injection, radiofrequency ablation is more effective in neoplasm destruction, which does not permit adequate diffusion of ethanol, but it has a higher risk of collateral damage to adjacent structures^[10,11]. Thus,

our approach was to inject deionized water to separate the ablation target and surrounding tissues. Furthermore, radiofrequency ablation induces thermal destruction of tissues by heating cells to a temperature higher than 60°C, causing irreversible cellular modification called *coagulative necrosis*^[12,13]. The instrument used in this study, RITA 1500, has a temperature controller. When the temperature of the tip of the needle reaches a preset point (95°C in this study), the instrument begins active treatment time and maintains

the temperature, causing cellular coagulative necrosis.

Our results preliminarily suggest that radiofrequency ablation is an effective and safe locoregional treatment for superficial distant lymph node metastasis. These observations should be further confirmed by more studies with larger sample sizes.

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References

- [1] Zaydfudim V, Feurer ID, Griffin MR, et al. The impact of lymphnode involvement on survival in patients with papillary and follicular thyroid carcinoma. *Surgery*, 2010,144:1070–1078.
- [2] Kawada K, Taketo MM. Significance and mechanism of lymph node metastasis in cancer progression. *Cancer Res*, 2011,71:1214–1218.
- [3] Gervais DA, Arellano RS, Mueller PR. Percutaneous radiofrequency ablation of nodal metastases. *Cardiovasc Intervent Radiol*, 2002,25:547–549.
- [4] Hiraki T, Yasui K, Mimura H, et al. Radiofrequency ablation of metastatic mediastinal lymph nodes during cooling and temperature monitoring of the tracheal mucosa to prevent thermal tracheal damage: initial experience. *Radiology*, 2005,237:1068–1074.
- [5] Fisher B. Laboratory and clinical research in breast cancer—a personal adventure: the David A. Karnofsky memorial lecture. *Cancer Res*, 1980,40:3863–3874.
- [6] Hellman S. Karnofsky Memorial Lecture. Natural history of small breast cancers. *J Clin Oncol*, 1994,12:2229–2234.
- [7] Hirakawa S, Brown LF, Kodama S, et al. VEGF-C–induced lymphangiogenesis in sentinel lymph nodes promotes tumor metastasis to distant sites. *Blood*, 2007,109:1010–1017.
- [8] Solbiati L, Ierace T, Dellanoce M, et al. Percutaneous US-guided radiofrequency ablation of metastatic lymph nodes from papillary cancer of the thyroid gland: initial experience in two cases (abstr). *Radiology*, 1998,209:385.
- [9] Dupuy DE, Monchik JM, Decrea C, et al. Radiofrequency ablation of regional recurrence from well-differentiated thyroid malignancy. *Surgery*, 2001,130:971–977.
- [10] Germani G, Pleguezuelo M, Gurusamy K, et al. Clinical outcomes of radiofrequency ablation, percutaneous alcohol and acetic acid injection for hepatocellular carcinoma: a meta-analysis. *J Hepatol*, 2010,52:380–388.
- [11] Lewis BD, Hay ID, Charboneau JW, et al. Percutaneous ethanol injection for treatment of cervical lymph node metastases in patients with papillary thyroid carcinoma. *AJR Am J Roentgenol*, 2002,178:699–704.
- [12] Kakite S, Fujii S, Nakamatsu S, et al. Usefulness of administration of SPIO prior to RF ablation for evaluation of the therapeutic effect: an experimental study using miniature pigs. *Eur J Radiol*, 2011,78:282–286.
- [13] Goldberg SN, Gazelle GS, Mueller PR. Thermal ablation therapy for focal malignancy: a unified approach to underlying principles, techniques, and diagnostic imaging guidance. *AJR Am J Roentgenol*, 2000,174:323–331.