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The potential of photodynamic therapy to treat esophageal candidiasis coexisting with esophageal cancer

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ABSTRACT

Background: Photodynamic therapy (PDT) has been used in recent years to deal with fungal infections because of the prevalence of fungi resistance to drugs. However, PDT for gastrointestinal fungal infection has not been reported. This study was conducted to assess the potential of PDT to deal with esophageal candidiasis.

Methods: Two male patients with histological evidence of esophageal candidiasis coexisting with esophageal cancer were included in this retrospective study. Both patients were treated with PDT. This treatment was repeated at least 1 month after the initial PDT if the patient still had residual cancer or esophageal candidiasis. Short-term efficacy was evaluated on the basis of endoscopy and histology findings. Further follow-up data were obtained from endoscopy results or telephone conversation.

Results: The esophageal candidiasis located 21–24 cm and 25–28 cm from the incisors of case 1 reached complete remission after one and two PDT sessions, respectively. The esophageal cancer coexisting with esophageal candidiasis located 21–24 cm from the incisors reached complete remission after two PDT sessions. No recurrence was found at a 14-month follow-up. The esophageal cancer located 30–35 cm from the incisors reached partial response after three PDT sessions. Both of the esophageal candidiasis and the coexisting esophageal cancer at 23–26 cm from the incisors of case 2 reached complete remission and the esophageal cancer at 34–37 cm from the incisors reached complete remission after one PDT session. No recurrence was found at a 24-month follow-up. There were no serious adverse events found in either of the two cases.

Conclusion: Results of this preliminary study indicate that PDT may be a potential method to deal with esophageal candidiasis.

1. Introduction

Esophageal cancer is a very common cancer of the upper gastrointestinal tract, with an annual mortality near 100 per 100,000 [1]. Esophageal candidiasis (EC) was first reported in 1956 [2] and is well known to primarily affect immunocompromised hosts, such as patients with cancer, AIDS, or diabetes [3,4]. *Candida albicans* is the most prevalent pathogenic species of EC [5,6]. It is not rare to see patients with EC associated with esophageal cancer [7,8]. EC and esophageal cancer are treated with different methods. EC is usually treated with antifungal drugs, whereas esophageal cancer is controlled with surgery, radiation therapy, chemotherapy, or photodynamic therapy (PDT). PDT is a relatively new method for the treatment of tumors, which is based on the use of photosensitizers that can preferentially accumulate in tumor cells.

When a photosensitizer is activated by an appropriate wavelength of light, the photosensitizer interacts with oxygen to generate free radicals or singlet oxygen, which can cause selective destruction of tumor cells [9]. PDT has shown promising results both for advanced and early-stage esophageal cancer [10,11]. In May of 2010, we unintentionally cured the EC of one patient using PDT, which was initially aimed at treating the patient's coexisting esophageal carcinoma. In October of 2010, we again used this technique to deal with EC and the coexisting esophageal carcinoma for another patient and successfully cured the EC. Here we report our experience using PDT for the treatment of these two patients with esophageal carcinoma coexisting with an esophageal fungal infection.

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2. Materials and methods

2.1. Patients

Two patients with biopsy-proven, multiple-tumor esophageal carcinoma coexisting with EC were included in this retrospective study. Endoscopic classification of EC is according to Kodsi's grading system [12].

2.1.1. Case 1

A 53-year-old man, admitted to our hospital in May 2010, had been suffering from progressive severe dysphagia associated with acid reflux for 2 months. Endoscopy and biopsy showed that he had advanced, inoperable esophageal carcinoma occupying about two-thirds of the circumference located 30–35 cm from the incisors, esophageal circumferential lesions of EC (Grade III) located 25–28 cm from the incisors (Fig. 1), and esophageal carcinoma occupying about half of the circumference at 21–24 cm from the incisors that was coexisting with EC (Grade III). Computed tomography (CT) indicated he had no lymph node or distant metastases (T2 N0 M0).

His past medical history revealed a long history of hypertension (Grade 3), which was well-controlled with Metoprolol and multiple bilateral renal cysts. He had smoked 60 cigarettes a day for about 30 years and had been a heavy drinker for 25 years. Physical examination showed no unusual findings. Laboratory investigations showed a serum creatinine level of 161.7 μmol/L (normal, 44–133 μmol/L)) and a serum uric acid level of 543.7 μmol/L (normal, 90–360 μmol/L).

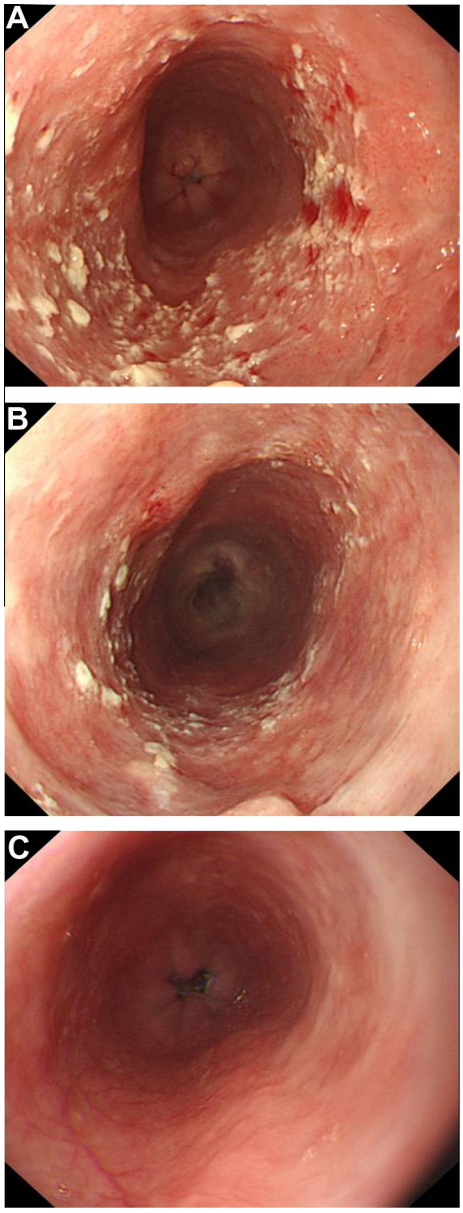

Fig. 1. Endoscopic images of the esophageal candidiasis at 25–28 cm from the incisors of case 1: (A) before PDT, (B) 6 months after the first PDT session, and (C) 2 months after the second PDT session.

2.1.2. Case 2

A 46-year-old man, who had visited our hospital with no subjective symptoms of esophageal carcinoma was later diagnosed, by endoscopy conducted at a local hospital as having early-stage esophageal carcinoma and gastric cancer. He underwent subtotal gastrectomy with Billroth II reconstruction for gastric cancer in the local hospital. 2 months later, in October of 2010, he was referred to our hospital for treatment of esophageal carcinoma. Endoscopy and biopsy conducted by our hospital revealed that he had esophageal carcinoma *in situ* occupying about half of the circumference at 23–26 cm from the incisors that was coexisting with EC (Grade II) (Fig. 2) and esophageal carcinoma *in situ* occupying about half of the circumference at 34–37 cm from the incisors. CT scans showed he had no lymph node or distant metastases (Tis N0 M0). Physical examination and laboratory data showed no unusual findings.

Family history showed his mother died of esophageal carcinoma and his father died of prostate cancer.

2.2. Treatment protocol

Informed written consent was obtained from each patient before initiation of PDT. Photocarcinorin (PSD-007; Institute of Pharmacochemistry of the Second Military Medical University, Shanghai, China) was the photosensitizer used in this study. Details about Photocarcinorin have been described previously by our group [13]. After a negative skin allergy test, the two patients were intravenously injected with Photocarcinorin at 5 mg/kg body weight. Six hours later, after a standard endoscopic examination was performed with a flexible endoscope (GIF-H260, Olympus, Japan), a 3.0-cm cylindrical quartz fiber (Medlight, S.A. Switzerland) coupled with a 630-nm semiconductor laser (Shenzhen Laser medical Tech Co., Ltd., China) was inserted through the working channel of the endoscope to the lesions. Then, laser irradiation was conducted from distal to proximal lesions of the esophagus. A power density of 150 mW/cm^2 with an exposure time of 30 min was used for lesions that had esophageal carcinoma or esophageal carcinoma coexisting with EC, and a power density of 150 mW/cm^2 with an exposure time of 15 min was used for esophagus with fungal infection alone. In both patients, intraluminal illumination was used. General anesthesia was used in case 1 and pharyngeal anesthesia was used in case 2. Patients were asked to keep away from direct exposure to sunlight or strong light for at least 1 month after Photocarcinorin administration.

The case 2 patient was treated with oxaliplatin/5-fluorouracil (FOLFOX) for gastric cancer at 2 days before and 2 weeks after PDT. Both patients were given an oral proton pump inhibitor for at least 1 month following PDT. Antibiotics were used for 7–14 days according to the patient's condition. Details of the treatment protocol are shown in Table 1.