

Photodynamic Therapy for Upper Gastrointestinal Cancers during Past 25 Years in China

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ABSTRACT

Objective: To evaluate the status of photodynamic therapy (PDT) for upper gastrointestinal cancers, and then discuss how to solve the problems that hinder the development of PDT. **Methods:** A total of 30 pertinent literatures about PDT for upper gastrointestinal cancers during past 25 years were collected through the retrieval of several related medical databases (Chinese Medical Current Contents, China Bio-Medical Bibliographic Database, China Journal Fulltext Database). The data, including the gender, age of patients, tumor position, pathologic findings, treatment efficacy, adverse effects and the applied laser and photosensitizer, were statistically analyzed. **Results:** For all the 1687 cases with upper gastrointestinal cancers, the excellent-effective rate (complete remission or prominent remission) and effective rate (complete remission or prominent remission or minor remission) were 53.2% and 87%, respectively. The therapeutic effect of combined treatment (PDT with other methods) was superior to that of PDT ($u=4.456$, $P<0.01$). All the involved pathological types were sensitive to PDT. Different photosensitizers and lasers were used by different authors, but all of them were effective without any serious side effect. **Conclusion:** PDT shows a radical effect on the tumors of early stage and a favorable palliative effect on the tumors of advanced stage, so it is one of the optional strategies for the treatment of upper gastrointestinal cancers.

Key words: Photodynamic therapy; Upper gastrointestinal cancers; Laser

Cancers of the upper gastrointestinal tract, including carcinoma of esophagus, cardia or stomach, are some of the most common malignancies in China. According to the data of 1990–1992, the mortality rate of gastric cancer was 32.84 per 100 thousand people for men, and 17.01 per 100 thousand for women, ranking the first among the cancers that caused death in China. The mortality rate caused by esophageal carcinoma for men was 22.14 per 100 thousand people, and 13.24 per 100 thousand for women, as the third leading cause of cancer death in men and the second in women respectively^[1]. Thus upper gastrointestinal cancers are of great significance in clinical practice. At present, surgery, radiotherapy and chemotherapy are the mainstream therapeutic modalities. If the cancer is diagnosed and treated early, most patients may recover very well^[2]. However, many tumors are of advanced stage when

discovered. Some relapse after surgery and can not be cleared surgically, others can not be well controlled even with radiotherapy or chemotherapy. Moreover, some of the patients are not suitable candidates for chemo- or radiation therapies. Others frankly refuse these therapies. Photodynamic therapy (PDT) is efficacious in achieving good palliative results, and usually well tolerated by patients with few adverse effects^[3-6]. China is one of the countries that pioneered in using PDT to treat cancers of upper gastrointestinal tract. In this article, pertinent literatures since 1980 of using PDT to treat upper gastrointestinal cancers in China were collected and analyzed.

MATERIALS AND METHODS

Materials

A total of 30 pertinent literatures of PDT for upper gastrointestinal cancers from 19 different areas of China during 1982-2006 were collected

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through the retrieval of several related medical databases (Chinese Medical Current Contents, China Bio-Medical Bibliographic Database, and Chinese Journal Full-Text Database). An article was included in the analysis only when a standard evaluation on PDT efficacy was described. If the same case was reported repeatedly, only the latest report or the one with most cases was included.

Methods

The data, including the gender, age of patients, tumor position, pathologic findings, treatment efficacy, adverse effects and the applied laser and photosensitizer, were statistically analyzed. The efficacy of PDT was evaluated by WHO standards for malignancy. Complete remission (CR) means completely tumor disappearance and negative pathological results for at least 1 month; prominent remission (PR) means tumor size reduction by at least 50% for over 1 month; minor remission (MR) means tumor size reduction by less than 50% for over 1 month; no remission (NR) means no change or no increase of tumor size^[7].

Statistical Analysis

The data were divided into several groups and analyzed by SPSS statistical data analysis software. A *P* value of less than 0.05 was considered statistically significant.

RESULTS

We found 30 articles that met our inclusion criteria. In the included studies, 1687 cases of upper gastrointestinal cancers were treated with PDT, with the age ranging from 9 to 90 years old. Among these, 1199 cases were male and 488 cases were female. 1035 cases had carcinoma of esophagus, 449 cases had carcinoma of cardia, 167 cases had carcinoma of stomach, and the other 36 cases had no record of the tumor origin. For the pathological classifications, there were 758 cases

of squamous carcinoma, 357 cases of adenocarcinoma, 43 cases of poorly differentiated adenocarcinoma, 5 cases of undifferentiated adenocarcinoma, 2 cases of signet-ring cell carcinoma, 2 cases of stromal tumour, and no record for the remaining 520 cases. Most patients either missed the opportunity of surgery, or refused the surgery, or had postoperative relapse.

Efficacy

A total of 166 cases achieved CR (9.8%), 732 cases had PR (43.4%), 570 cases had MR (33.8%), and 219 cases maintained NR (13.0%). The objective response rate (CR+PR) was 53.2%, and the overall response rate (CR+PR+MR) was 87%. Three hundred and six patients were treated by PDT combined with other therapies such as radiotherapy, microwave, YAG laser, stent, local or systemic chemotherapy. In these cases, 47 cases were of CR (15.4%), 152 cases PR (49.7%), 70 cases MR (22.9%), and 37 cases NR (12.1%), with the objective response rate of 65.1%, and the total response rate of 87.9%. There was significant difference between the combined treatment group and the PDT monotherapy group (*P*<0.01). The effect of PDT on the different pathological types was not clearly defined in most articles, and no data suggested that different pathological type might react differently to the treatment (Tab. 1).

Choice of Laser

Five kinds of laser were used in the 30 articles, but only one wavelength of 630 nm was used. In 1980s, argon ion-pumped dye laser and He-Ne laser were used most. The main laser type used to treat 857 patients in the 13 articles in 1990s was the MJZ-I pulse copper vapor laser developed by the Electromechanical Equipment Factory of Zhejiang University. Afterwards, the gold vapor laser made by the Institute of Electronics of Chinese Academy of Science was also used. Since 2003, diode laser has been used to treat the 182 patients mentioned in 7 articles (Tab. 2).

Tab. 1. The therapeutic effect of PDT and PDT combined other modalities to upper gastrointestinal cancers n (%)

Different groups	n	CR	PR	MR	NR
PDT only group	1381	119 (8.6)	580 (42.0)	500 (36.2)	182 (13.2)
Therapeutic alliance group	306	47 (15.4)	152 (49.7)	70 (22.9)	37 (12.1)
Total	1687	166 (9.8)	732 (43.4)	570 (33.8)	219 (13.0)

Note: $u=4.456 > 2.58$, *P*<0.01