

Comparison of Traditional Chinese Medicine with Western Medicine Cancer Therapy

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ABSTRACT The interactions among drugs, tumor and host are critical for a response to therapy and for outcome. Anticancer herbs used in Chinese medicine are classified into 4 groups based on their target (tumor, patient and drug) as follows: eliminating pathogenic factors, strengthening the body resistance, enhancing effects of chemotherapy and detoxication of chemotherapy. Correspondingly, anticancer drugs used in Western medicine can be classified into 4 groups as follows: cytotoxic drugs, biological response modifiers, chemosensitizers and chemoprotectants.

Based on the theory of Chinese medicinal formulas, prescriptions are composed of four constituents, namely, primary constituent (main component of the formula prescription), minister constituent (second component of formula prescription), adjuvant constituent (adjuvant component of the formula prescription) and messenger constituent (component making the formula prescription targeting pathological tissues). To control the interaction among drugs and to modulate the interaction among the tumor, patient and drugs, we suggest that combined therapy for Western medicine might include 4 constituents, i.e., primary, cooperative, adjuvant and modulatory constituent. Cytotoxic drugs frequently are used as primary and cooperative constituents, whereas biological response modifiers and biochemical modulators are usually regarded respectively as adjuvant drugs and modulatory constituents.

We believe these new concepts may be helpful for the aim of appropriately designing, evaluating or providing combination therapy.

KEY WORDS: Chinese medicinal formula, chemotherapy, cancer.

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Introduction

Herbs have been used as anticancer drugs for more than thousands of years. The activity of an herb can be altered by another herb, and such interaction can often be clinically significant. Compounded prescriptions are a feature of Traditional Chinese Medicine (TCM), which is the art of making use of the interaction of herbs to enhance the therapeutic effects and reduce side reactions.

Combined chemotherapy is a critical method of anticancer strategy in Western medicine to improve the therapeutic response and outcome. Multidrug Western regimens usually include different drugs that have the different pharmacological mechanisms and toxic reactions to increase efficacy and decrease toxicity. What inspiration can be drawn from a comparative study of anticancer therapy between TCM and Western medicine?

The classification of anticancer drugs based on targets

The interaction among the tumor, patient and drug plays a critical role in controlling tumors. Functional interactions between the host and abnormal cells can be altered by the tumor cells at different stages of carcinogenesis^[1]. This homeostasis between host and tumor cells also may be altered by anticancer drugs. Cytotoxic drugs not only suppress cancer tissue but, also have a suppressive effect on the immune system, whereas some non-cytotoxic drugs can modulate the interaction among tumor cells, host response and cytotoxic drugs.

Anticancer herbs can be classified into 4 groups based on their target (tumor, patient and drug) as follows: eliminating pathogenic factors, strengthening the body resistance, enhancing the effects of chemotherapy and detoxication of chemotherapy. Correspondingly, anticancer drugs in Western medicine can be classified into 4 groups based on their targets, i.e., cytotoxic drugs, biological response modifiers (BRMs), chemosensitizers and chemoprotectants. Cytotoxic drugs can eliminate tumor tissue, BRMs can regulate the host response of carcinogenesis, chemosensitizers can affect the metabolic pathway of cytotoxic drugs to enhance the chemosensitivity, and chemoprotectants can reduce the toxic side effects of cytotoxic drugs (Table 1).

The host response to the tumor has a two-edged effect on carcinogenesis-suppression and promotion. On one hand, the immune system can eliminate the tumor cells. On the other hand, the host response contributes to tumor progression by angiogenesis and metastasis. BRMs can regulate the host response to carcinogenesis by suppressing the tumor growth and metastasis.

Cytotoxic drugs can kill tumor cells directly, while biochemical modulators lack visible antitumor activity in their own right. There are 2 groups of biochemical modulators-chemosensitizers and chemoprotectants. Drug resistance is a major reason for poor responses and failures in cancer chemotherapy, while chemosensitizers can enhance the chemosensitivity to reduce drug resistance. Dose-limiting toxicity secondary to chemotherapy may reduce tumor control because of the inability to deliver adequate dose-intensive therapy against the cancer. However, chemoprotectants can provide protection for normal tissues, without compromising antitumor efficacy. They may allow the delivery of higher cumulative doses of cytotoxic agents without the expected consequence of toxicity.

Prescription composition of combined chemotherapy

In TCM theory, prescriptions are composed of 4 con-

Table 1. Classification of anticancer drugs based on mechanism of activity.

Western Medicine	Target	Traditional Chinese Medicine
Cytotoxic drug	Tumor	Eliminating pathogenic factor
Alkylating agents		Promote blood circulation to remove stagnancy
Antibiotics		Eliminate phlegm and resolve masses
Antimetabolites		Clear away heat-toxin
Topoisomerase inhibitors		-
Mitosis inhibitors		-
Others		-
Biological response modifier	Patient	Strengthening the body resistance
Cytokines		Supplement vital Qi
Tumor vaccine		Warm Yang
Adoptive immunotherapy		Tonify blood
-		Nourish Yin
Chemosensitizer	Drug	Enhancing effects of chemotherapy
Toremifene		Radix Ginseng
Tamoxifen		Radix Stephaniase Tetrandrae
Fluoxetine		Rhizoma Ligustici Chuanxiong
Chemoprotectant	Drug	Detoxication of chemotherapy
Mesna		Regulate stomach
Calcium folinate		Tonify blood
Amifostine		-
Dexrazoxane		-
Uracil		-

Table 2. Prescription composition of combined chemotherapy in Traditional Chinese Medicine and Western medicine.

Traditional Chinese Medicine	Western Medicine		
	Classification	Target	Drugs
Primary constituent	Primary constituent	Tumor	Cytotoxic drug
Minister constituent	Cooperative constituent	Tumor	Cytotoxic drug
Adjuvant constituent	Adjuvant constituent	Patient	Biological response modifier
Messenger constituent	Modulatory constituent	Drug	Chemosensitizer and chemoprotectant

Table 3. Prescription of combined chemotherapy in Western medicine.

Prescription	Primary constituent	Cooperative constituent	Adjuvant constituent	Modulatory constituent
IP	Cisplatin	Ifosfamide	-	Mesna
IE	Epirubicin	Ifosfamide	-	Mesna
FLP	5-Fu	Cisplatin	-	CF
Gemcitabine + CF + 5-Fu	5-Fu	Gemcitabine	-	CF
FOLFORI	5-Fu	Irinotecan	-	CF
VIP	Cisplatin	Ifosfamide, etoposide	-	Mesna, G-CSF
TIP	Paclitaxel	Ifosfamide, cisplatin	-	Mesna, G-CSF
Dacarbazine+cisplatin + IFN- α + IL-2	Dacarbazine	Cisplatin	IFN- α IL-2	-

5-Fu: 5-fluorouracil; CF: folic acid; G-CSF: granulocyte colony-stimulating factor; IFN- α : Interferon alpha; IL-2: Interleukin-2.

stituents, i.e., primary constituent (main component of the formula prescription), minister constituent (second component of the formula prescription), adjuvant constituent (adjuvant component of the formula prescription) and messenger constituent (component making formula prescription targeting pathological tissues), to make adequate use of the interaction of herbs to enhance therapeutic effects and reduce side reactions^[2]. Correspondingly, we suggest that combined therapy in Western medicine may include four constituents: primary, cooperative, adjuvant and modulatory constituent. Cytotoxic drugs frequently are used as primary and cooperative constituents, whereas BRMs and biochemical modulators are usually regarded as adjuvant constituent and modulatory constituent respectively in combined therapy (Table 2). For example, chemotherapy combined with cisplatin, 5-Fluorouracil and folic acid is the standard treatment for gastric cancer. 5-fluorouracil is a primary drug for gastric cancer and cisplatin has a cooperative antitumor effect with 5-fluorouracil. Folic acid can reduce the side toxicity of 5-fluorouracil. So the primary, cooperative and modulatory constituents are 5-fluorouracil, cisplatin and folic acid respectively (Table 3). Recently, immunotherapy has been regarded as part of combinations for the treatment of cancer, and high-dose chemotherapy with hematopoietic growth factor support has been used in high-risk patients with many cancers, such as breast cancer, lymphoma, acute myeloid leukaemia and small cell lung cancer^[3-11].

Conclusions

The interactions among drugs, tumor and patient are critical for a response to therapy and for outcome. So we suggest that anticancer drugs can be classified into 4 groups as their target (tumor, patient and drug): namely a cytotoxic drug, biological response modifier (BRM), chemosensitizer and chemoprotectant. Furthermore, we suggest that combined therapy in Western medicine might include 4 constituents, such as primary, cooperative, adjuvant and modulatory agents, to make adequate use of the interaction among drugs and modulate the interaction among the tumor, patient and drugs. In this way, a new combined therapeutic standard could be set up in Western medicine to continuously raise the medical level. We believe this new concept of combined therapy may be helpful for the goal of appropriately designing, evaluating or providing combination therapy.

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