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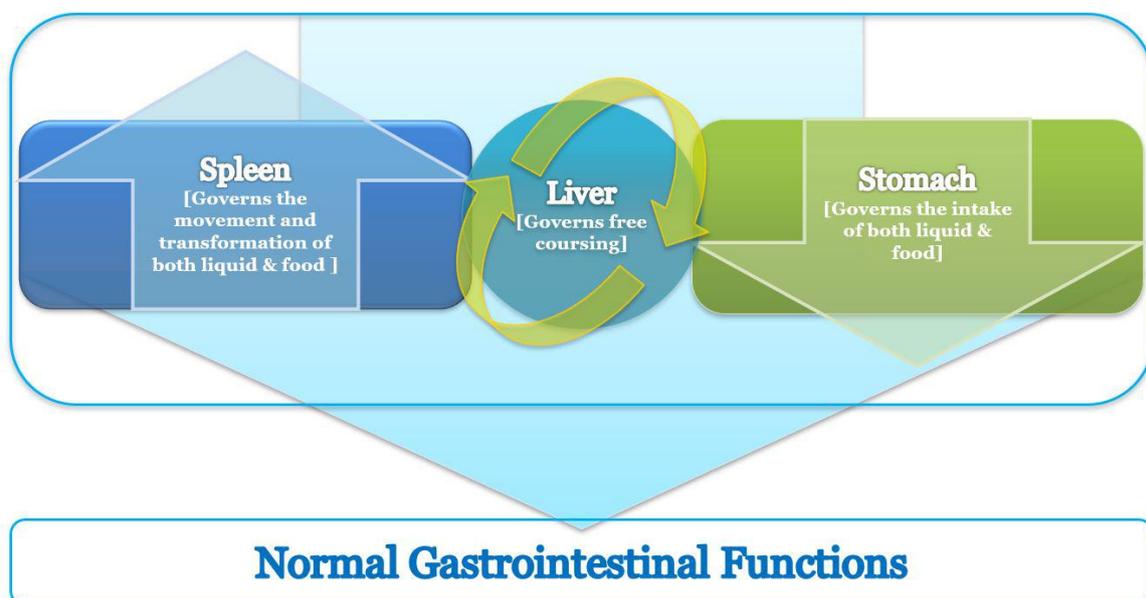
*TMR Integrative Nursing***Auricular therapy for chemotherapy-induced nausea and vomiting in cancer patients: Perspectives from the traditional zang-fu organs and meridians theory**Jing-Yu Tan^{1,2*}, Lorna K. P. Suen¹, Tao Wang^{1,2}

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Highlights

- This paper presents the theoretical background of using auricular therapy (AT) for managing chemotherapy-induced nausea and vomiting (CINV) from the perspectives of traditional zang-fu organs and meridian theory.
- Clinical studies based on such theory have well supported the beneficial effects of AT on CINV.
- Relationships between the traditional zang-fu organs and meridians theory and the modern medicine understanding of the CINV mechanisms remain unknown and should be further explored in future pre-clinical and clinical research.



Abstract

This paper presents the theoretical background of using auricular therapy (AT) for managing chemotherapy-induced nausea and vomiting (CINV) from the perspectives of traditional zang-fu organs and meridian theory. The zang-fu organs of stomach, spleen and liver play a crucial role in regulating the gastrointestinal functions. The chemotherapeutic agents can significantly impede the gastrointestinal functions and subsequently contribute to various gastrointestinal symptoms including nausea and vomiting. Dysfunctions of the stomach, spleen and liver can correspond to specific auricular acupoints, while by stimulating those acupoints, the chaotic Qi movement can be reversed to its normal status, and the hyperactivities of the gastrointestinal system can also be alleviated to reduce the CINV symptoms. Clinical studies based on such theory have well supported the effects of AT on CINV. However, relationships between the traditional theory and the modern medicine understanding of the CINV mechanisms remain unknown and should be further explored in future research.

Keywords: Auricular therapy, Nausea and vomiting, Chemotherapy, Neoplasms, Medicine, Chinese traditional

Abbreviations:

CINV, Chemotherapy-induced nausea and vomiting; AT, Auricular therapy.

Competing interests:

The authors declare that there is no conflict of interest.

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This paper is part of the work contained within the PhD thesis of Dr Jing-Yu Tan. Figures that are presented in this paper are derived and modified from the original thesis. Contents, presentation, styles of in-text citations and referencing list of the original chapter in the thesis have been partially modified and reorganised to fit the journal requirement.

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Introduction

Chemotherapy has been widely applied as one of the most effective antineoplastic therapies to improve cancer patient prognosis. However, chemotherapy can also contribute to various unpleasant symptoms that significantly deteriorate patients' functional status and increase their physical, psychological and financial burden [1, 2]. Among which, chemotherapy-induced nausea and vomiting (CINV) have become one of the most frequently identified symptoms in cancer patients [3], especially among those receiving moderately to highly emetogenic chemotherapy [4]. Several antiemetics, including NK1 receptor antagonists (e.g. Aprepitant) and 5-HT3 receptor antagonists (e.g. Palonosetron), have been recommended as the first-line treatment for CINV [3]. While other non-pharmacological interventions have also been commonly utilized as adjuvant approaches to antiemetics given antiemetics alone cannot fully manage the nausea and emesis symptoms [5].

Being an important traditional health approach that has been long-term used for managing various health conditions, auricular therapy (AT) has been recognized as a promising treatment option to alleviate CINV [6]. AT is supported by the traditional zang-fu organs and meridians theory and the homuncular reflex theory which recognize a bidirectional connection between pathological conditions presented in particular parts of the human body and certain auricular acupoints located in the ear [7, 8]. The traditional zang-fu organs and meridians theory further advances the understanding of the underlying mechanisms of AT by involving the concepts of zang-fu organs and the linkage between zang-fu organ dysfunctions and their corresponding reflections on specific auricular acupoints [7, 8]. Despite the popularity of AT for CINV management [6], its underlying theoretical background has not been systematically discussed yet. This discussion paper was therefore presented to brief the theoretical framework of using auricular therapy for CINV management from the perspectives of the traditional zang-fu organs and meridians theory.

This discussion paper is part of the work contained within the first author's PhD thesis presenting a clinical research project to explore the value of AT for the management of CINV in cancer patients [9]. This paper started with an introduction of the roles of three zang-fu organs - spleen, stomach and liver, in coordination of the normal gastrointestinal functions, and the theoretical causality between the dysfunctions of those zang-fu organs and the onset of CINV symptoms. The selection of specific acupoints for

nausea and vomiting alleviation and the theoretical rationale of using AT for CINV management based on the traditional zang-fu organs and meridians theory was elaborated afterwards in subsequent sections.

Roles of Zang-fu organs in coordination of the normal gastrointestinal functions

Traditional Chinese medicine recognizes that disharmony and imbalance of Qi circulation is the primary cause of different types of health disorders [10]. Qi is also believed to be one of the most vital substances in the construction and maintenance of all human body functions by circulating into different zang-fu organs to facilitate and coordinate energy transformations and body movements [10, 11].

The traditional zang-fu organs and meridians theory views that the normal activities and functions of the gastrointestinal system are supported by two major zang-fu organs, the spleen and the stomach, which are regarded as the roof of the later heaven and the source of the formation of Qi and blood [12-15]. The main function of stomach is to govern the intake of food and liquids, with the stomach Qi flowing particularly downward [15-17]. While the functions of the spleen are closely associated with the stomach and are primarily responsible for the movement and subsequent transformation of the food and liquids into essential elements to support the basic functions of human body, and the spleen Qi is flowing particularly upward [7, 15-17]. The zang-fu organs of stomach and spleen are working congruently to regulate the normal activities and functions of the gastrointestinal system [13, 15, 17].

Apart from the stomach and the spleen, the liver also plays a critical role in supporting the normal activities of the gastrointestinal system [16, 17]. The traditional zang-fu organs and meridians theory believes that liver can support the normal stomach function in intaking liquid and food and the descending of stomach Qi, while concurrently strength the normal spleen's functions in transporting and transforming liquid and food into body essences and the ascending of spleen Qi [17]. There is also a mutual supporting relationship among the stomach, the spleen and the liver, where a good function of the stomach and the spleen, can, in turn, enhance the liver's supporting role [12]. [Figure 1](#) presents the roles of the three zang-fu organs in supporting the gastrointestinal system functions and their interrelationships.

Dysfunctions of spleen, stomach and liver

and the onset of nausea and vomiting symptoms

The close relationships between the stomach, spleen and liver highlight a causality that dysfunctions in one organ can impede the other one's function. For example, dysfunction of the stomach in intaking food and liquids and the

chaotic movement of the stomach Qi can impede the spleen functions in the further transportation and transformation process and distort the flow of the spleen Qi, and vice versa [16]. Dysfunction of the liver can also lead to a chaotic flow of stomach Qi which subsequently affects spleen functions [12, 16, 17].

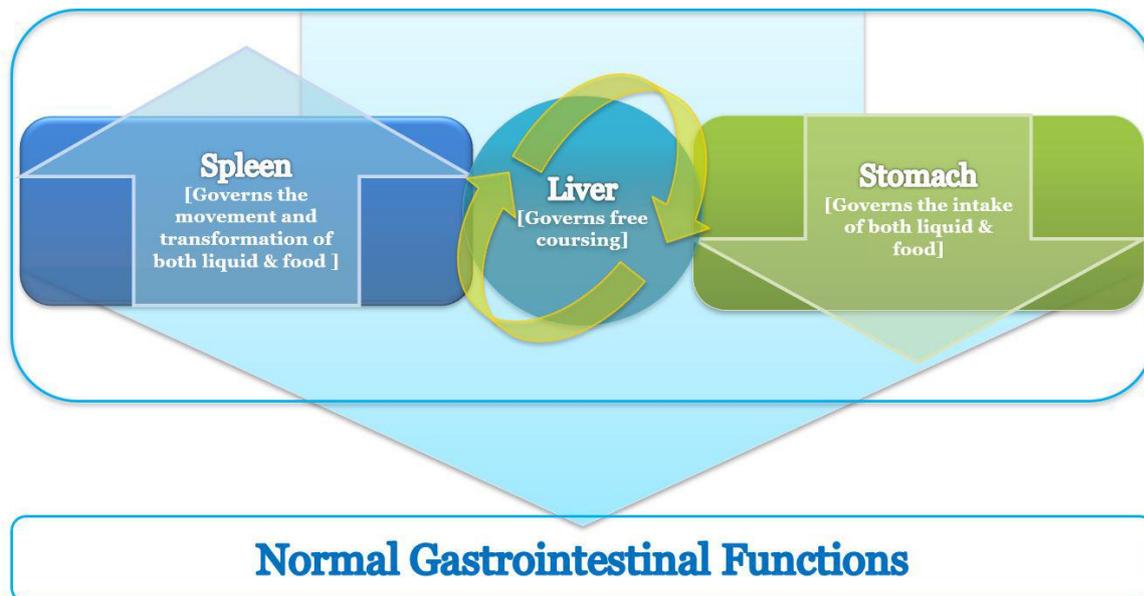


Figure 1: Normal gastrointestinal functions maintained by the stomach, spleen, and liver

Disruption of the Qi movement among the stomach, spleen and liver can be introduced by certain pathological conditions, which further contributes to a series of gastrointestinal problems [16]. The traditional zang-fu organs and meridians theory has identified two key pathogeneses of the nausea and vomiting symptoms: dysfunction of spleen in movement and transportation and dysfunction of stomach in turbidity elimination [15, 18]. While “the loss of gastric homeostasis and the ascending Qi flow” (p. 143) has been recognized as the primary cause of emesis [16].

Traditional Chinese medicine views chemotherapeutic agents as fire toxins, which can produce strong effects to eliminate neoplasms but can also act upon the zang-fu organs of stomach and spleen, and significantly distort their Qi circulation, which result in the Qi deficiency of the spleen and stomach, and the upward movement of the stomach Qi [12, 13, 15, 18, 19]. Given the liver's close associations with the stomach and the spleen, the reversed flow of the stomach and spleen Qi further negatively impact on the liver functions [12]. All of which can significantly distort the normal gastrointestinal activities to process the gastric contents, lead to a dysfunction of the gastrointestinal system, and subsequently

contribute to series of symptoms including nausea, vomiting, and abdominal distension [16, 18]. As the most direct result of the disruption of Qi movement, the reversed (upward) flow of the stomach Qi would bring up gastric contents [16], and lead to the symptoms of nausea and vomiting in cancer patients undergoing chemotherapy. Figure 2 presents the roles of the disrupted Qi movements and dysfunctions of the stomach, spleen and liver in the development of CINV symptoms.

Role of auricular therapy in managing chemotherapy-induced nausea and vomiting

To alleviate the nausea and vomiting symptoms and restore the gastrointestinal functions, the chaotic flow of Qi between the stomach, spleen, and liver should be reversed to its normal status. The traditional zang-fu organs and meridians theory together with the homuncular reflex theory as the fundamental theories of AT indicate that pathological conditions occurred in particular parts of the human body or zang-fu organs would have their reflections on certain auricular acupoints located in the out auricle, while stimulation of

those acupoints can return some treatment effects in improving the corresponding health problems [7, 8, 20]. In cancer patients experiencing CINV, the involved zang-fu organs of stomach, spleen and liver also have their projected acupoints. Specifically, the stomach (including the cardia) corresponds to the ear acupoints “stomach (CO4)” and “cardia (CO3),” the spleen has its specific projection to the auricular acupoint “spleen (CO13),” while the liver has its corresponding auricular acupoint named “liver (CO12)”.

“Cardia” and “stomach” are the two key acupoints for CINV management given their direct connections with the dysfunctional zang-fu organs during the onset of nausea and vomiting symptoms;

stimulation of the two acupoints can facilitate the removal of the fire toxin, readjustment of the chaotic movement of stomach Qi to the normal (descending) flow, and regulation of the gastrointestinal smooth muscle activities to alleviate nausea and vomiting symptoms [7, 11, 21]. Given the functional association between the stomach and the spleen, the acupoint “spleen” should also be stimulated to improve the spleen functions and assist with the emesis management [7, 21, 22]. While stimulation of the acupoint “liver” can return some beneficial effects in eliminating the Qi stagnation of the liver and further strengthen the liver’s role in supporting the functions of stomach and spleen [7, 11, 22].

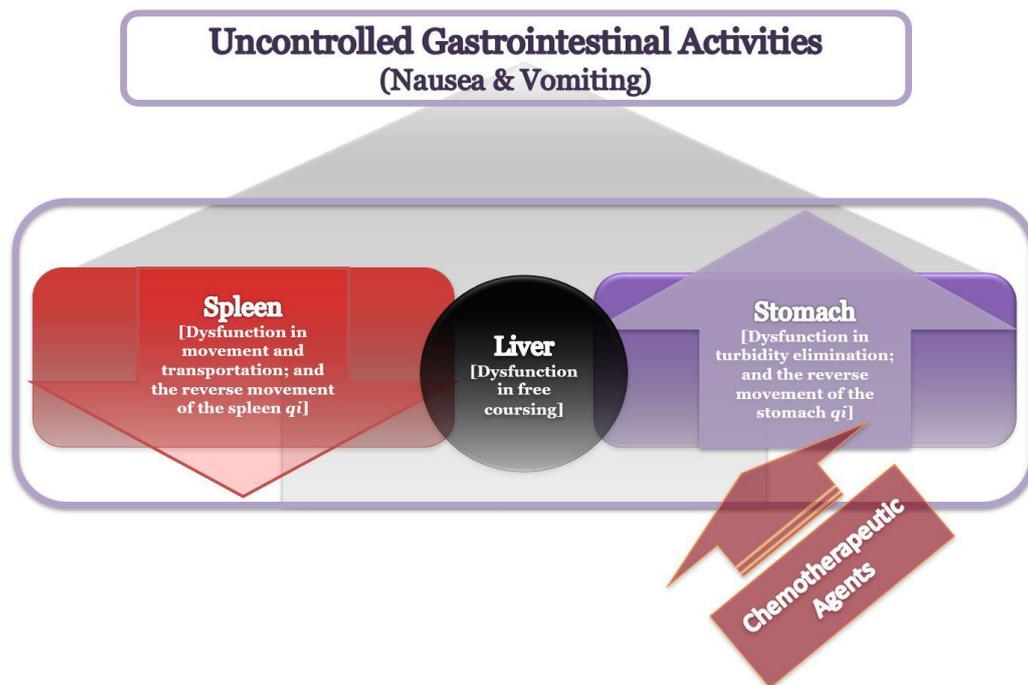


Figure 2: Dysfunctions of the stomach, spleen, and liver in the development of CINV

The auricular acupoints of “cardia”, “stomach”, “spleen” and “liver” have been frequently utilized in clinical practice and research for managing nausea and vomiting symptoms [7, 21, 23]. By stimulating these acupoints which are directly corresponding to the zang-fu organs involved in the CINV symptoms, the chaotic flow of Qi between those zang-fu organs can be reversed to its normal status, and the hyperactivities of the gastrointestinal smooth muscles can also be alleviated to reduce the nausea and vomiting symptoms. In addition, Abbate (2003) [24] indicated that the stomach and spleen take another important role in the facilitation of blood formation which can be impeded by the antineoplastic agents; while stimulation of relevant auricular acupoints can help the stomach and

spleen to restore their functions in supporting blood formation [24], which may also contribute to the CINV management. Figure 3 presents a comprehensive picture illustrating the relationship between the dysfunctions of the stomach, spleen and liver during cancer chemotherapy and the onset of CINV symptoms, as well as the roles of the acupoints “stomach”, “cardia”, “spleen”, and “liver” in CINV management during AT treatment.

Summary and implication

This paper discussed the roles of zang-fu organs - stomach, spleen, and liver, and their Qi movements in the regulation of normal gastrointestinal functions, and the causality between the dysfunctions of these organs and the

onset of CINV symptoms, all of which provide a strong theoretical rationale for the selection of targeted auricular acupoints for use in AT for CINV management. The homuncular reflex theory has shared a common understanding with the traditional zang-fu organs and meridians theory on a close linkage between the pathological conditions presented in certain body parts and

biological reflections on particular auricular acupoints [7, 8], while the latter one has further advanced the underlying mechanism of AT from a zang-fu organ perspective, which concludes an important acupoint selection principle by selecting those acupoints directly corresponded to the involved zang-fu organs in certain health conditions.

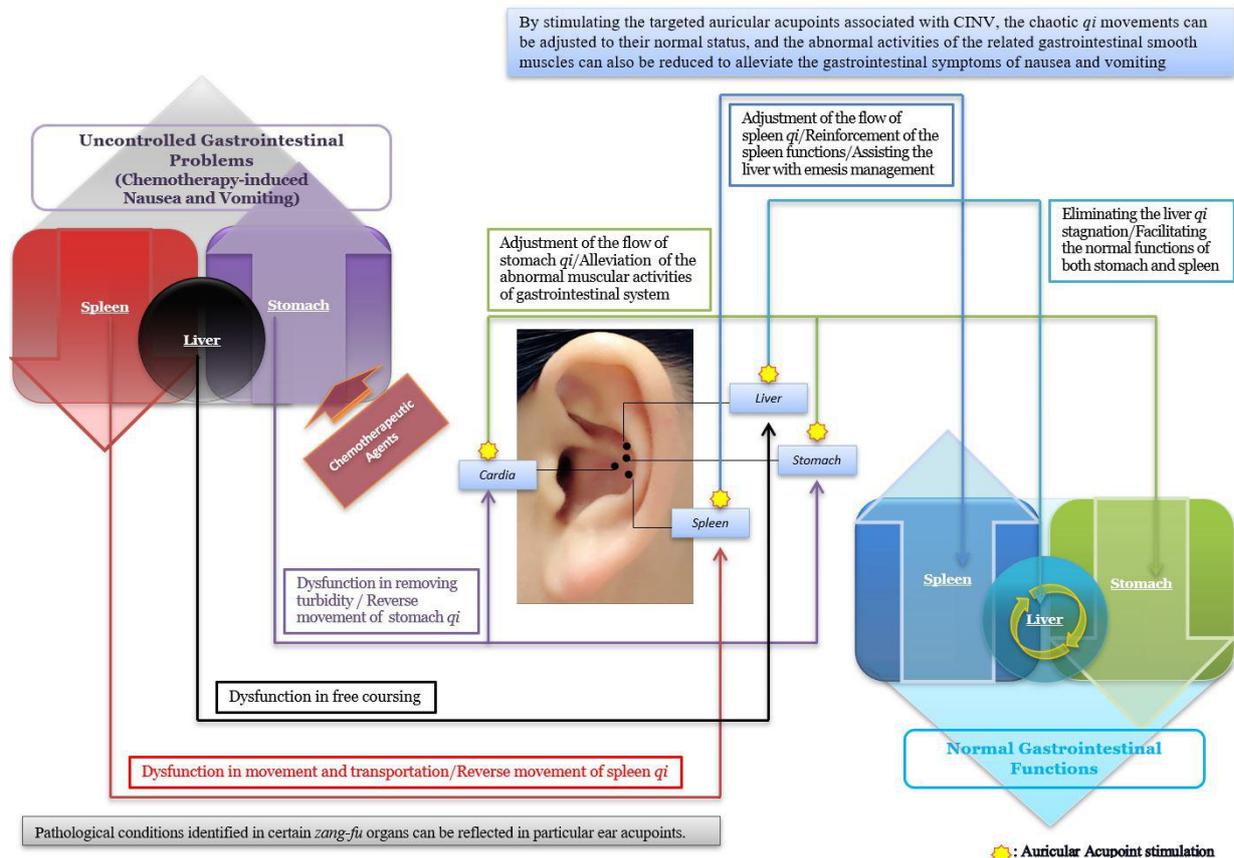


Figure 3: Theoretical rationale for adopting AT for CINV management

This paper presented the underlying mechanism of using AT for CINV management from the perspectives of the traditional zang-fu organs and meridians theory. Clinical studies based on such theory have been performed to well support the beneficial effects of AT on CINV [6]. However, relationships between the traditional zang-fu organs and meridians theory and the modern medicine understanding of CINV mechanisms remain unknown. The modern medicine believes that CINV is evoked through an “emetic centre” located centrally in the brain and mediated by a variety of neurotransmitters including 5-HT3 and NK1 [25-28]. Future CINV studies on the changes of neurotransmitter expression levels and gastrointestinal activities during AT treatment and their correlations with patient symptom outcomes

can help further clarify the underlying mechanisms of using AT for CINV management and establish connections between the traditional zang-fu organs and meridians theory and the modern medicine mechanisms of CINV.

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