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A Review of Mechanism Research on Traditional Chinese Medicine Intervention in Gastrointestinal Function Rehabilitation after Gastric Cancer Surgery from the Perspective of the Tongjiang Theory

Jie Gao[1,3], Pengli Wang[2,*], Xuemei Shang[3]

[1]Shaanxi University of Chinese Medicine, Xianyang 712046, Shaanxi, China
[2]Affiliated Hospital of Shaanxi University of Chinese Medicine, Xianyang 712000, Shaanxi, China
[3]Shenmu Hospital, Yulin 719300, Shaanxi, China
**Correspondence Author*

Abstract: ***Gastrointestinal dysfunction following gastric cancer surgery is a pivotal clinical challenge affecting patient recovery. Conventional modern medical therapies have certain limitations, while intervention strategies based on the Traditional Chinese Medicine (TCM) "Tongjiang Theory" demonstrate unique advantages through multi-target and holistic regulation. Centering on the principle that "the stomach governs descending and functions harmoniously when unobstructed," this theory summarizes the core pathogenesis after surgery as "stagnation of qi in the middle energizer and failure of fu-organs to descend," thereby deriving the intervention principle of "regulating qi and promoting descent" to address the branch and "fortifying the spleen and supporting the healthy qi" to address the root. This article systematically reviews the comprehensive TCM intervention system based on this theory, including pattern-differentiated internal treatments represented by formulas such as Sijunzi Decoction, Banxia Xiexin Decoction, and Chengqi-class prescriptions, as well as characteristic external therapies like acupuncture and Chinese herbal enemas. Modern mechanistic research has revealed the scientific connotation of these interventions from multiple dimensions, primarily involving networked pathways such as regulating the brain-gut axis neuroendocrine function, mitigating systemic and local excessive inflammatory responses, repairing the intestinal mucosal barrier, and regulating microecological balance. This paper posits that the "Tongjiang Theory" provides an excellent theoretical framework for integratively understanding and managing the complex postoperative pathophysiological changes. Future research should focus on conducting high-quality evidence-based studies, deepening integrated multi-omics mechanistic exploration, and promoting its deep integration and innovation with modern enhanced recovery after surgery pathways.***

Keywords: Tongjiang Theory, Post-Gastrectomy, Gastrointestinal Function Rehabilitation, Traditional Chinese Medicine Therapy, Mechanism of Action, Review.

1. Introduction

Gastric cancer is a highly prevalent and life-threatening malignancy worldwide, and radical surgery remains the cornerstone curative approach [1]. However, gastrectomy, while removing the lesion, often leads to postoperative gastrointestinal dysfunction, with an incidence rate as high as 20%-30% [2]. Clinical manifestations include delayed gastric emptying (postoperative gastroparesis), postoperative ileus, abdominal distension, nausea, and vomiting. These complications not only significantly prolong hospital stays and increase healthcare burdens but also severely impact patients' nutritional status, tolerance to subsequent anti-tumor therapies, and overall quality of life, presenting a critical challenge in modern gastric cancer surgical treatment [3].

Current modern medicine primarily employs symptomatic therapies such as prokinetic agents, gastrointestinal decompression, and parenteral nutritional support. While essential, these approaches have limitations, including relatively single targets, limited efficacy in some patients, and potential side effects [4]. Therefore, exploring holistic and individualized rehabilitation strategies is of significant clinical importance. In this context, the value of TCM interventions based on the "holistic concept" and "treatment based on pattern differentiation" in the perioperative period is increasingly recognized.

TCM views surgical trauma as a "golden blade injury," directly depleting qi and blood in the middle energizer and disturbing the ascending-descending pivot of the spleen and stomach. The "Tongjiang Theory," originating from the Huangdi Neijing (Yellow Emperor's Inner Canon) and established in Zhang Zhongjing's Shang Han Lun (Treatise on Cold Damage Diseases), is a core TCM theory for explaining the physiology and pathology of the spleen, stomach, and fu-organs. It emphasizes that "the six fu-organs function by being unobstructed and descending is their normal direction" [5]. After gastric cancer surgery, the "descending" function of the stomach and intestines fails, leading to the key pathological state of "fu-qi obstruction." This theory provides an incisive theoretical framework for systematically interpreting postoperative syndromes and guiding clinical intervention. In recent years, substantial clinical research has confirmed the efficacy of TCM therapies based on the "Tongjiang Theory," such as modified classical formulas and acupuncture [6, 7]. Concurrently, modern mechanistic studies have progressively deepened from multiple dimensions, including regulating gastrointestinal hormones, inhibiting inflammation, and protecting the intestinal barrier [8, 9]. However, challenges remain in this field, such as the need for more high-quality clinical evidence, insufficient systematic elucidation of mechanisms, and inadequate integration with modern rehabilitation pathways. This article aims to systematically review the understanding of pathogenesis, intervention strategies, and research progress on the

mechanisms of action under the guidance of the "Tongjiang Theory," to provide references for deepening theoretical understanding and optimizing academic research and clinical practice.

2. Interpretation of TCM Pathogenesis of Gastrointestinal Dysfunction after Gastric Cancer Surgery under the Guidance of the "Tongjiang Theory"

Based on the physiological characteristic of the six fu-organs that "transport and transform substances rather than store them," the "Tongjiang Theory" profoundly reveals the principle that the qi of fu-organs like the stomach and intestines flows smoothly downward. Radical gastrectomy, as a "golden blade injury," not only removes the substantial organ but also profoundly disrupts the dynamic balance of qi movement in the middle energizer. Its pathological evolution presents a dynamically intertwined process of "injury to both form and qi, disruption of the pivot, and accumulation of turbid pathogens."

2.1 Injury by the Golden Blade, Deficiency of Qi and Blood: The Material Basis of Functional Disorder

Surgical removal of the substantial part of the stomach directly constitutes "injury to form." According to the theory that "the spleen and stomach are the source of qi and blood generation," injury to the stomach's form inevitably leads to impaired generation of nutrient-blood and depletion of spleen-stomach qi [10]. Symptoms in early postoperative patients, such as pale complexion, lassitude, poor appetite, and weak pulse, are manifestations of spleen-stomach qi deficiency and dual deficiency of qi and blood. This stage establishes the material and functional foundation for the occurrence and subsequent evolution of functional disorders.

2.2 Disruption of the Pivot, Failure of Descending: The Core Link of Functional Disorder

The spleen and stomach reside in the middle energizer, serving as the pivot for the ascending and descending of qi throughout the body. Factors such as surgical trauma, anesthesia, and postoperative anxiety can abruptly disturb this pivot, causing abnormal ascent and descent. Professor Wang Xixing, a master of TCM, points out that "disorder of qi movement and ascent-descent is the main pathogenic characteristic of complications after gastric cancer surgery" [11]. Its core manifestations are "failure of descent" and "rebellious qi movement": Stomach qi, which should descend, rebels upward, causing belching, nausea, and vomiting; intestinal qi, which should flow, stagnates internally, resulting in abdominal distension and pain. At this stage, "qi stagnation" becomes the core pathogenesis. If not properly managed, qi stagnation can further impede blood circulation and fluid metabolism, leading to internal stasis of blood and generation of damp-turbidity, complicating the pathogenesis.

2.3 Accumulation of Turbid Pathogens, Obstruction of Fu-Qi: The Intensified State of Functional Disorder

On the basis of qi stagnation, if pathological products (such as phlegm-dampness, static blood, food stagnation) accumulate and bind together, they obstruct the intestines, causing complete obstruction of fu-qi. This can clinically evolve into critical signs resembling paralytic ileus, such as a drum-tight abdomen, tenderness with guarding, and cessation of defecation and flatus [12]. This state is highly correlated with the pathological condition recognized in modern medicine involving a storm of postoperative inflammatory mediators, inhibition of the intestinal motility network, and stasis of intestinal contents, reflecting the intrinsic connection between the TCM concept of "internal accumulation of turbid pathogens" and the modern "inflammation-dysfunction" model.

2.4 General Pathogenesis Summary and Dynamic Evolution

In summary, under the framework of the "Tongjiang Theory," the core pathogenesis of postoperative gastrointestinal dysfunction can be summarized as: initiating from "surgical injury to form and depletion of qi and blood," developing through "stagnation in the middle energizer and disruption of the pivot," and intensifying into "accumulation of turbid pathogens and obstruction of fu-qi." Its nature is fundamentally deficiency in origin and excess in manifestation, with deficiency and excess interwoven. Deficiency of origin (root) persists throughout, focusing on spleen-stomach qi and blood; excess of manifestation (branch) is the prominent contradiction at specific stages, focusing on qi stagnation and fu-organ excess, often complicated by phlegm, dampness, and stasis. Clinically, it is essential to dynamically identify the evolution of the pathogenesis to provide a fundamental basis for establishing the precise treatment principle of "promoting descent to treat the branch and supporting the healthy qi to secure the root."

3. TCM Intervention Strategies and Practice Based on the "Tongjiang Theory"

The "Tongjiang Theory" directly guides the formation of a set of comprehensive, multi-level, and individualized intervention strategies aimed at "restoring the descending function." These strategies encompass internal herbal medicine, external techniques, and combined therapies, emphasizing synergistic effects.

3.1 Core Therapeutic Principle: Promoting Descent to Treat the Branch, Supporting the Healthy Qi to Secure the Root

Addressing the core pathogenesis of "deficiency in origin and excess in manifestation, with fu-qi obstruction" after surgery, the clinical therapeutic principle is established as "regulating qi, harmonizing the stomach, and unblocking the fu-organs" to treat the branch (manifestation), and "fortifying the spleen, boosting qi, and nourishing blood" to secure the root (origin). The key lies in dynamically balancing the emphasis between "promoting descent/unblocking" and "tonifying/supporting" according to the different postoperative stages (excess patterns like qi stagnation are more prominent early on, while deficiency signs become more apparent later) and the patient's specific pattern, aiming to achieve precise treatment that "expels pathogens without damaging the healthy qi, and

tonifies deficiency without hindering the flow."

3.2 Internal Herbal Medicine System: Pattern Differentiation and Core Formulas/Herbs

Oral administration of Chinese herbal medicine is the main channel for practicing the "Tongjiang" concept. Clinically, classical formulas are often flexibly modified based on pattern differentiation. Major therapeutic methods include: The method of fortifying the spleen and boosting qi, suitable for patterns dominated by spleen-stomach qi deficiency, represented by Sijunzi Decoction and its variants (e.g., Xiangsha Liujunzi Decoction). Research shows they can significantly improve postoperative symptoms and nutritional indicators [13]. The method of acrid opening and bitter descending, suitable for patterns of cold-heat complexity and blockage in the middle energizer, represented by Banxia Xiexin Decoction, which is effective in restoring ascent and descent by balancing cold and heat [14]. The method of harmonizing the stomach and descending rebellion, targeting pronounced belching and vomiting due to stomach qi rebellion, commonly using Xuanfu Daizhe Decoction or Chaihu Guizhi Ganjiang Decoction. The method of unblocking the fu-organs and dispelling stagnation, targeting fu-organ excess and stagnation patterns, may involve the judicious use of Dachengqi Decoction or milder formulas like Jiawei Tongfu Decoction, administered orally or via enema to purge heat and promote movement [15]. Beyond established formulas, core herb pairs formed around the "Tongjiang" theme (e.g., Baizhu-Fuling, Chaihu-Baishao) are widely used in clinical practice. A data mining study analyzing 61 prescriptions for treating postoperative dysfunction found that the core herbs were spleen-fortifying and qi-regulating ones like Baizhu, Fuling, Chenpi, and Gancao, reflecting the overall approach of treating from the spleen and lung, regulating qi movement, and addressing both branch and root [16].

3.3 External and Acupuncture Therapies: Multi-Pathway Synergistic Enhancement

External therapies act through channels, collaterals, and acupoints, synergizing with internal therapies, and are particularly suitable for patients with oral intake difficulty in the early postoperative period. Acupuncture therapy has solid evidence. A multicenter randomized controlled trial (n=585) published in Gastroenterology confirmed that postoperative electroacupuncture at bilateral Zusanli (ST36), Neiguan (PC6), and Shangjuxu (ST37) significantly shortened the time to first flatus and defecation and reduced the incidence of delayed postoperative ileus after laparoscopic gastrectomy for gastric cancer [17]. Chinese herbal enemas allow direct action on the intestines, suitable for oral difficulty or low intestinal obstruction. Studies show that retention enemas with Chengqi-class formulas can effectively promote intestinal function recovery [18]. Additionally, moxibustion, acupoint application, and auricular acupressure can serve as adjuncts, providing warming, unblocking, and qi-regulating synergistic effects.

3.4 Comprehensive Intervention Strategies and Protocol Optimization

In clinical practice, combined strategies like acupuncture with herbs and internal with external treatments are often used to enhance efficacy. For example, the combined application of acupuncture and herbs (e.g., Simo Oral Liquid) under the guidance of the "descending qi, harmonizing stomach, and unblocking fu-organs" method shows synergistic advantages in restoring gastrointestinal function and regulating immunity. Future efforts need to focus on constructing sequential intervention protocols based on "disease-pattern-stage" combination, clarifying the optimal timing and combination modes for various therapies at different perioperative stages to promote standardized application.

4. Research Progress on the Mechanisms of TCM Intervention

Modern research confirms from multiple levels that interventions based on the "Tongjiang Theory" promote postoperative recovery through multi-target, network-integrated effects. The core mechanisms mainly involve several interrelated aspects: neuroendocrine regulation, immune-inflammatory modulation, and barrier-microecology repair.

4.1 Regulating the Neuroendocrine Network, Restoring Gastrointestinal Motility

The coordinated movement of gastrointestinal function is precisely regulated by a complex neuroendocrine network. Studies show TCM interventions can effectively modulate key nodes of this network. Regarding regulating gastrointestinal hormone balance, clinical research confirms that spleen-fortifying and interior-unblocking herbal formulas can correct postoperative hormone imbalance, for example, significantly increasing plasma motilin and gastrin levels while decreasing vasoactive intestinal peptide and somatostatin levels, thereby positively promoting gastrointestinal peristalsis [19]. Regarding repairing enteric nervous system (ENS) function, experimental studies show that certain Chinese herbal compounds can promote the reconstruction of the ENS network in post-gastrectomy model rats, regulating the expression of key neurotransmitters like acetylcholine, substance P, nitric oxide, and their receptors, fundamentally improving intestinal motility from the neural regulation level [20].

4.2 Repairing the Intestinal Mucosal Barrier, Regulating Immunity and Microecological Balance

Postoperative stress often damages the intestinal barrier, leading to microbiota/endotoxin translocation and immune dysfunction. Research finds that Chinese herbal compounds with descending/unblocking and supporting effects can enhance intestinal mucosal barrier function. Mechanisms include upregulating tight junction protein expression to reduce intestinal permeability and alleviating intestinal epithelial inflammatory damage by inhibiting inflammatory pathways like NF-κB [21]. Simultaneously, these interventions can regulate the intestinal microecology, promoting the growth of beneficial bacteria and the generation of metabolites like short-chain fatty acids, thereby

maintaining barrier stability through multiple synergistic links. In regulating immune response, spleen-fortifying and qi-regulating interventions have been observed to increase the ratio of $CD3^+$, $CD4^+$ T lymphocytes in peripheral blood and mucosal secretory immunoglobulin A levels in patients, reflecting the unified action of "supporting the healthy qi" and "promoting descent" at the immune level [22].

4.3 Inhibiting Excessive Inflammatory Response, Regulating Related Signaling Pathways

The systemic and local excessive inflammatory response triggered by surgical trauma is a core link leading to gastrointestinal paralysis. Network pharmacology analysis suggests that the potential targets of high-frequency core herb pairs (e.g., Baizhu-Fuling) for treating this condition are enriched in classic signaling pathways like PI3K-Akt and MAPK [23]. Experimental studies further confirm that some Chinese herbal compounds can reduce the expression of pro-inflammatory cytokines like tumor necrosis factor-α and interleukin-6 by inhibiting the activation of the NF-κB core inflammatory signaling pathway, thereby alleviating intestinal inflammatory damage [24]. With the development of systems biology, research integrating multi-omics technologies such as metabolomics and metagenomics is beginning to explain, from a systems level, the networked mechanisms by which Chinese herbal compounds improve the postoperative gastrointestinal microenvironment by regulating host-microbiota metabolic interactions [25].

5. Discussion and Prospects

With its systemic and dynamic theoretical characteristics, the "Tongjiang Theory" provides an excellent top-level conceptual framework for the integrative understanding of the complex, multi-system, networked disordered pathological state of the postoperative gastrointestinal tract after gastric cancer. Current evidence indicates that comprehensive interventions based on this theory are clinically effective, and modern mechanistic research has preliminarily revealed their scientific connotation of exerting holistic regulatory effects through multi-target networks involving neuroendocrine, immune-inflammatory, and intestinal microecological axes, showing high consistency with traditional theory.

However, research in this field still faces significant challenges that constrain the production of high-level evidence and the standardization and dissemination of clinical protocols. First, high-quality clinical evidence needs expansion. Although high-quality RCTs exist for acupuncture, high-standard, large-sample, multicenter studies for most Chinese herbal compounds are still insufficient, and the objective and standardized system for TCM pattern diagnosis and efficacy evaluation needs improvement. Second, the depth and systematicity of mechanistic research require strengthening. The logical chain connecting "disease-pattern-formula-efficacy-target" is not fully established. Explanations for key issues such as the synergistic mechanisms of multi-component herbal compounds and the neural circuitry of the somatic-visceral reflex in acupuncture need deepening. Finally, the integration of TCM and Western medicine rehabilitation pathways is still exploratory. How to precisely, standardly, and individualistically integrate TCM interventions into the entire modern perioperative Enhanced Recovery After Surgery (ERAS) management pathway to form an efficient synergistic protocol with consensus is the necessary path towards widespread clinical application.

Looking ahead, the following directions warrant focused breakthroughs: First, vigorously conduct clinical research with high levels of evidence, actively utilizing methods such as pragmatic RCTs, prospective cohorts, and real-world studies to accumulate high-grade evidence. Second, deepen integrated multi-omics and systems pharmacology research, panoramically analyze the biological networks affected by "Tongjiang" interventions, clarify their pharmacodynamic material basis and core targets, and promote precision medicine. Third, actively promote the deep integration and innovation of TCM and Western medicine rehabilitation pathways, develop modern Chinese herbal formulations suitable for postoperative use, and formulate, update, and promote relevant clinical practice guidelines and expert consensus based on accumulating evidence.

In summary, the "Tongjiang Theory" is a valuable theoretical asset guiding TCM intervention in gastrointestinal function rehabilitation after gastric cancer surgery, characterized by a distinct holistic and dynamic view. The comprehensive intervention strategies under its guidance, coordinated through multiple pathways like herbs and acupuncture, demonstrate unique advantages in clinical practice through multi-target, networked regulation. Current research has made significant progress in clinical efficacy verification and elucidation of some molecular mechanisms. In the future, only through sustained rigorous clinical research design, deep integration of cutting-edge scientific and technological methods, and active promotion of interdisciplinary clinical translation practice can we further profoundly reveal the modern scientific connotation of the "Tongjiang Theory," ultimately promoting the construction of a more optimized, effective, and individualized new model of integrated TCM and Western medicine postoperative rehabilitation, thereby benefiting a broader patient population.

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