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Application of rehabilitation in gastrointestinal dysfunction in patients with hepatitis B

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Abstract. The secondary dysfunction of hepatitis B is usually gastrointestinal dysfunction, motor dysfunction, sensory disorders, sleep disorders, and further aggravation may even lead to liver failure. Among them, gastrointestinal dysfunction is the main symptom that troubles patients and is not conducive to prognosis. In this paper, the application of traditional Chinese and Western medicine rehabilitation in hepatitis B gastrointestinal dysfunction and related treatment mechanisms were reviewed. After studying related articles, it was found that: Traditional Chinese medicine rehabilitation pays attention to the overall function of patients, emphasizes the coordination of heart and rest, and focuses on traditional Chinese medicine regulation, body exercises, massage techniques, acupuncture, acupoint application and other methods; Modern medical rehabilitation attaches importance to the ability of patients to return to society, and mainly adopts physical therapy, occupational therapy, speech therapy and other methods. Among them, traditional Chinese medicine has various rehabilitation methods for gastrointestinal dysfunction of hepatitis B, and most of the current research focuses on traditional Chinese medicine and acupuncture. Modern medicine for rehabilitating this dysfunction, clinical research, and basic research are temporarily lacking. The rehabilitation method of integrated Chinese and Western medicine is more advantageous for the treatment of gastrointestinal dysfunction of hepatitis B. This article will provide new ideas for the rehabilitation of patients with gastrointestinal dysfunction of hepatitis B.

Keywords: Hepatitis B, Gastrointestinal dysfunction, Rehabilitation.

1. Introduction

Hepatitis B is a global public health issue affecting hundreds of millions of individuals. Statistics indicate that in 2019, approximately 2.9 billion people globally were infected with the hepatitis B virus, with a significant proportion concentrated in Asia. Infection with the hepatitis B virus is also identified as one of the risk factors associated with the development of liver cancer [1-3]. These patients often

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experience gastrointestinal dysfunctions such as nausea, vomiting, loss of appetite, and constipation, significantly impacting their quality of life. Clinical treatments primarily revolve around antiviral medications; however, these drugs are expensive, and the subsequent conventional care model is relatively limited, constituting a significant factor contributing to poor patient prognosis. Therefore, developing individualized approaches suitable for patients is of paramount importance for the rehabilitation of hepatitis B-induced gastrointestinal dysfunctions. Current research in rehabilitation predominantly focuses on the nervous and musculoskeletal systems, with relatively fewer studies addressing visceral rehabilitation. Based on clinically verified methodologies and foundational experiments, this article summarizes the integrated Chinese and Western medicine rehabilitation approaches for chronic gastrointestinal dysfunction of hepatitis B, aiming to provide theoretical guidance for clinical practices.

2. Etiology of Gastrointestinal Dysfunctions in Patients with Chronic Hepatitis B

2.1. Traditional Chinese Medicine's Understanding of the Etiology of Gastrointestinal Dysfunctions in Patients with Chronic Hepatitis B

Traditional Chinese medicine does not specifically designate hepatitis B as a disease but categorizes it under 'jaundice' (Huangdan) or 'flank pain,' (Xietong) attributing its causes to insufficient Zhengqi (righteous qi) and the invasion of damp-heat evils [4]. Referring to the criteria outlined by the Hepatobiliary Disease Branch of the Chinese Association of Traditional Chinese Medicine in the *Diagnostic Criteria of Viral Hepatitis in Traditional Chinese Medicine (2017 Edition)*, hepatitis B is categorized into five syndrome types: liver depression and spleen deficiency, damp-heat obstructing stagnation, liver-kidney yin deficiency, spleen-kidney yang deficiency, and stasis blocking collaterals [5].

The liver, a solid organ, stores blood and regulates excretion, while the spleen governs transportation and transformation, dispersing essence and regulating blood. Some symptoms of viral hepatitis, such as poor appetite, fatigue, bloody stools, and jaundice, coincide with common spleen-related symptoms. Here, 'storage' refers to the concept in Chinese medicine rather than the anatomical meaning of organs. Therefore, liver diseases and spleen-stomach diseases are interconnected [6]. The importance of maintaining a healthy spleen-stomach for liver treatment is emphasized in Chinese medicine principles such as 'earth supporting wood' and 'treating the liver by first benefiting the spleen.' Normal liver excretory function assists the spleen-stomach in ascending clarity and descending turbidity; their mutual support is integral, and malfunction in one organ can disrupt the functions of the other. If the liver qi fails to disperse or the lesser yang does not function well, it can further lead to spleen yang failing to ascend, stagnation of gastric turbidity, resulting in abdominal distention. Alternatively, excessive dispersal of liver qi can cause the stomach qi to rise abnormally, leading to symptoms like nausea and vomiting [7]. The spleen and stomach constitute the foundation of acquired constitution; insufficient vital essence and blood circulation could affect liver disease progression. Therefore, the mutual support between spleen-stomach function and liver physiological function indicates that abnormalities in one aspect can cause functional disturbances in the other. This is the explanation from traditional Chinese medicine for the etiology of gastrointestinal dysfunctions in hepatitis B patients.

2.2. Modern Medicine's Understanding of the Etiology of Gastrointestinal Dysfunctions in Patients with Chronic Hepatitis B

During hepatitis B infection, the immune function of patients is in a disrupted state. The intestinal epithelial barrier function is vulnerable to damage, causing imbalances in the intestinal flora, impacting gastrointestinal motility, and resulting in decreased appetite [8, 9]. In patients with chronic hepatitis B, there's a reduction in the diversity and stability of intestinal flora, which may have a potential pathogenic effect on chronic hepatitis B [10]. Additionally, the liver itself can metabolize many gastrointestinal hormones, an identified effective substance for regulating intestinal motility. These hormones, including motilin (MOT), gastrin (GAS), and vasoactive intestinal peptide (VIP), play distinct roles in

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gastrointestinal dynamics. MOT can accelerate gastrointestinal emptying; GAS can promote gastric digestion and acid secretion, stimulating gastrointestinal motility and causing diarrhea; VIP affects smooth muscle movement in the intestine, increasing intestinal stress, potentially leading to diarrhea [11]. Disease-induced hepatic tissue alterations and impaired liver function contribute to poor nutrient absorption, inadequate removal of intracellular toxins, disrupted microbial metabolism, affecting the stomach, leading to imbalances in gastrointestinal function [12], resulting in symptoms such as nausea, vomiting, constipation, and diarrhea. This constitutes the modern medical explanation for the secondary gastrointestinal dysfunctions in hepatitis B.

3. Rehabilitation of Hepatitis B Gastrointestinal Dysfunction

3.1. Traditional Chinese Medicine Rehabilitation

3.1.1. Chinese Herbal Medicine Treatment. For gastrointestinal dysfunctions in patients with hepatitis B, symptoms such as poor appetite, abdominal distension, and nausea correlate with the descriptions of the Shaoyang syndrome in the 'Shang Han Lun' ('Treatise on Cold Damage'). The use of Xiaochaihu Tang can harmonize Shaoyang syndrome. When patients experience diarrhea and abdominal distension due to abnormal liver qi excretion function, Shengjiang San (Ascend and Descend Powder) is commonly used to regulate qi dynamics. As the liver is yang in nature and easily interacts with the spleen, disharmony between the liver and spleen leads to symptoms such as poor appetite, abdominal distension, and diarrhea. Clinically employed herbal formulas include Tong Xie Yao Fang (Painful Diarrhea Rectification Formula), Chai Hu Shu Gan San (Bupleurum Powder to Soothe the Liver), Chai Shao Liu Jun Zi Tang (Bupleurum and Peony Formula), and Xiao Yao San (Free and Easy Wanderer Formula) [13]. Selection and modification of appropriate herbal formulas based on patients' symptoms and signs are crucial. For instance, additions such as Chen Xiang (Agarwood), Dang Shen (Codonopsis), and processed Bai Zhu (Atractylodes) are used for poor appetite; Zhu Ru (Bamboo Shavings) is added for nausea and vomiting; Gan Jiang (Dried Ginger), Huang Qin (Scutellaria), and Huang Lian (Coptis) are added for diarrhea [14]. Clinical studies have shown that Ruan Gan Fang can effectively alleviate symptoms like poor appetite and abdominal distension [15].

Xiaochaihu Tang possesses the ability to harmonize the liver and stomach and resolve Shaoyang syndrome. A network pharmacology analysis of Xiaochaihu Tang revealed that active compounds such as quercetin, salicin, and capsaicin within this formula interact with targets related to anti-hepatitis B. Glycyrrhizin can inhibit NF-κB activity by regulating apoptosis and oxidative stress in liver cancer cells, enhance superoxide dismutase levels, resist hepatitis B virus, boost immunity, and aid in liver tissue and cell membrane repair. Peony and Angelica facilitate liver tissue repair and alleviate gastrointestinal dysfunction symptoms [16-18]. Tong Xie Yao Fang regulates gastrointestinal function through multiple pathways like PI3K-Akt and TNF [19].

3.1.2. Traditional Manipulative Techniques. Continuous abdominal massage can alleviate the physical and mental stress of patients and relieve symptoms of gastrointestinal dysfunction [20]. Abdominal massage often targets the Shenque acupoint, overlapping the palms on the abdomen above the line connecting the iliac crests, pelvic bones, and highest point of the inguinal region, massaging clockwise several times using techniques like pressing and pushing for about 15 minutes to regulate the meridians and smooth qi flow, thus promoting gastrointestinal peristalsis [21, 22]. Additionally, pressing points like Pishu, Weishu, and Tianshu can optimize treatment effects [23].

The regularity of gastrointestinal movement depends on gastrin and motilin, and acupressure can regulate the secretion of these hormones, exerting a positive regulatory effect [24]. Abdominal massage, as a non-invasive therapy, alters intra-abdominal pressure, enhances blood and lymph circulation, induces relaxation through endorphin secretion, stimulates the activity of the autonomic nervous system, and triggers gastrointestinal reflexes [23, 25].

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3.1.3. Traditional Chinese Exercise Methods. Based on the integration of the guidance method described in 'Zheng Yi Yuan Hou Lun' ('Treatise on the Origins and Symptoms of Various Diseases'), Wu Xiaoyun and others devised a set of exercises called 'Chronic Liver Disease Health-preserving Exercise.' The third section, 'Palms Up to Ribs to Eliminate Accumulation,' involves a practitioner sitting upright or in a cross-legged position, extending their back, slowly raising the left arm palm-down to eye level, then turning the palm upwards, and bending the right arm against the right ribs. This exercise promotes smooth qi movement and improves gastrointestinal function [26]. Within the Ba Duan Jin, the movement 'Lifting the Single Leg to Regulate the Spleen and Stomach' through the pulling and massaging action of both arms, improves intestinal microecology [27].

Research has shown that Ba Duan Jin can improve blood circulation in the gastrointestinal organs, directly regulate the middle-jiao spleen and stomach, and enhance digestive functions [28]. Additionally, Tai Chi Yun Shou has the function of regulating the Du meridian, improving the liver and spleen, coordinating organ functions, and improving gastrointestinal function [29]. Liu Zi Jue, through guided breathing, regulates the qi of the five zang organs and six fu organs, fortifying against external pathogens and promoting recovery.

3.1.4. Acupuncture. Both animal experiments and clinical trials have discovered that acupuncture at points Zusanli, Changqiang, Waiguan, and Zhongwan with balanced reinforcing and reducing techniques for 30 minutes, or the application of electroacupuncture, can ameliorate gastrointestinal motility disorders [30]. Various meta-analyses found Neiguan to be effective in treating nausea and vomiting. Both acupressure and acupuncture (retaining the needle after achieving qi, leaving it in for 30 minutes) or transcutaneous acupoint electrical stimulation can improve patient symptoms [31-33]. Zhu Qin and others found through clinical randomized controlled trials that injecting 2ml of Astragalus membranaceus extract into the Zusanli acupoint twice a week for six months per course, with two courses, significantly improved patient appetite [34]. Moxibustion at Zhongwan and Pishu can regulate liver qi and invigorate the spleen, improving symptoms of poor appetite and gastrointestinal dysfunction. This method is simple, safe, and yields minimal adverse effects [35].

Acupuncture, as a mechanical stimulus, translates mechanical signals into neurochemical signals upon needle insertion, inducing cellular responses. A-α, A-β, A-δ, and C fibers are considered the basis of acupuncture neural mechanisms. Acupuncture can significantly regulate gastrointestinal movement only when the stimulation intensity surpasses the thresholds of A-δ and C fibers [36, 37]. ST36 is a primary acupoint on the Stomach meridian of Foot Yangming. Electroacupuncture at ST36 can regulate the expression of several proteins such as p53, Bcl-2, and c-myc in the gastric mucosa, aiding in the repair of gastric mucosal tissues. Stimulating ST36 also restores intestinal neuronal function, improving intestinal motility disorders [38]. After gastrointestinal toxin invasion, enterochromaffin cells in the intestine may be activated and release a large amount of serotonin. Vagal sensory terminals expressing serotonin 3 receptor genes (Htr3a+) surround these cells, gathering vital information about pathogen invasion by responding to serotonin [39]. Needling PC6 increases regulation of the vagus nerve, alleviating nausea and vomiting associated with the vagus nerve [40]. Additionally, studies have found that moxibustion increases probiotics, reduces pathogenic bacteria, improves gut microbiota, and enhances anti-inflammatory factors [41, 42].

3.1.5. Acupoint Application. Qí Xuěyáng supplemented specific treatments for patients by applying auricular pressure beads. Acupoints included Lung, Subcortex, Small Intestine, Large Intestine, Sympathetic, Stomach, Spleen, and others, with each acupoint pressed in a spiral motion. Patients experiencing sourness, numbness, distension, and slight pain indicated the arrival of qi. Each acupoint was pressed for 2-5 minutes, 3-5 times a day, for a 5-day course, alongside clockwise abdominal massages, proving to be effective in alleviating abdominal distension caused by chronic hepatitis B [43].

Moreover, the external application of a mixture of musk and nitre with white vinegar at the umbilicus effectively alleviates abdominal distension in patients with hepatitis B. From a traditional Chinese medicine perspective, the Shenque acupoint is closely related to Ren and Du meridians, stomach, and

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kidneys. From a modern medical viewpoint, the umbilicus has a significant number of blood vessels and good microcirculation. Some components in musk enhance the action of beta-adrenergic receptors, stimulating the central nervous system. Pharmacological studies of nitre have shown its ability to reduce serum D-lactic acid levels, stimulate gastrointestinal motility, and protect the gastric mucosal barrier [44].

3.1.6. Other Approaches. Traditional Chinese medicinal dietary therapy is also used in the treatment of gastrointestinal dysfunction post-hepatitis B. Medicinal foods associated with the Liver meridian, such as goji berries, mulberries, Chinese Angelica, and Chinese Wolfberry, are considered high-quality nutritional supplements. Among them, goji berries, a natural medicine, inhibit the expression of hepatitis B virus surface antigens and antibodies, thus suppressing the hepatitis B virus [46]. Mulberries are rich in natural free radical scavengers, clearing various free radicals like hydrogen peroxide and superoxide anions. Their efficacy is comparable to the clinical liver cell protector, magnesium isoglycyrrhizinate, protecting liver cells [47]. Furthermore, traditional Chinese emotional therapy, including music therapy and emotional counterbalancing therapy, can regulate patients' negative emotions, thereby promoting the recovery of gastrointestinal dysfunction.

3.2. Modern Medical Rehabilitation

3.2.1. Physical Therapy. In Western medicine, rehabilitation methods for gastrointestinal dysfunction in hepatitis B patients involve physical factors: transcutaneous electrical stimulation of Neiguan (frequency 10-20Hz, 5 minutes) can relieve vomiting [48]. Infrared therapy improves symptoms of abdominal distension and diarrhea, while shortwave therapy promotes gastrointestinal digestion. The WLGY-801 computerized liver disease treatment device has been clinically proven effective for patients experiencing loss of appetite and abdominal distension [49].

Current research on transcutaneous electrical stimulation for gastrointestinal dysfunction is limited to specific gastrointestinal acupoints such as Neiguan and Zusanli. Its mechanism in alleviating gastrointestinal symptoms is closely related to changes in sympathetic nervous system balance [50]. Studies indicate that near-infrared light therapy might improve intestinal dysfunction by activating the PGC-1α/Nrf2 signaling pathway [51]. The WLGY-801 computerized liver disease treatment device can improve liver circulation and promote the activation and regeneration of liver cells [49].

3.2.2. Occupational Therapy. Occupational therapy requires an assessment of the individual functional status of patients. Based on their personal interests, providing leisure-based occupational therapy activities such as playing cards, sewing, fishing, flower arranging, etc., aims to treat diseases and promote recovery [52]. However, there is limited research on relevant occupational therapies for individual symptoms of liver diseases.

3.2.3. Other Therapies. Probiotic preparations can exert bidirectional regulatory effects on patients with gastrointestinal dysfunction, directly improving their gut microbiota and promoting mucosal integrity [53, 54]. Zorba and others used Swedish massage techniques on patients experiencing nausea and vomiting, conducting foot massages for 10 minutes per foot. Simultaneously, they employed aromatherapy by placing a sponge soaked in a 2ml essential oil mixture at the patient's nostrils and instructed them to inhale normally for 3 minutes, alleviating the patient's nausea and vomiting symptoms [55].

4. Conclusion

Integrated research shows that traditional medicine offers diverse and relatively comprehensive methods for the rehabilitation of liver and gastrointestinal dysfunction. However, modern medical research on such rehabilitation remains limited. Application of rehabilitation techniques for hepatitis B patients, tailoring individualized rehabilitation plans for their gastrointestinal dysfunction, and continuously

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strengthening interdisciplinary integration is crucial. Combining traditional and Western medicine rehabilitation can reduce treatment side effects, prolong treatment efficacy, and enhance safety. Non-invasive treatments in traditional Chinese medicine rehabilitation, such as techniques and massage, can offer better complementary effects, delaying disease progression and functioning preventively. Effectively combining both approaches is our long-term goal.

However, several shortcomings exist in the rehabilitation of liver and gastrointestinal dysfunction: (1) Some traditional Chinese medical techniques and acupuncture lack unified standards, and some related mechanisms remain unclear, requiring further in-depth research. (2) Modern medical rehabilitation focusing on visceral rehabilitation primarily involves cardiopulmonary rehabilitation, with limited content on liver rehabilitation and scarce related clinical studies. (3) The effectiveness of occupational therapy for gastrointestinal dysfunction, and which occupational therapy methods are effective, need further refinement to establish a foundation for standardizing hepatitis B rehabilitation.

Therefore, in future work, it is essential to further promote and perfect methods for visceral, especially liver rehabilitation, and foster standardization of related treatment methods. As a burgeoning medical discipline, rehabilitation can continually enhance integration with other medical fields to optimize treatment outcomes. Future exploration can delve into how to better combine traditional and Western medicine rehabilitation to formulate systematic rehabilitation plans tailored to individual patient symptoms, thereby aiding in the systematization of liver rehabilitation.

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