

Analysis of the Medication Rule of Li Dongyuan based on Lanshi Micang Ulcer and Sore

Xinxin Fan¹, Nan Zhang^{2,*}

¹Department of Dermatology, Hospital of Northwestern Polytechnical University, Xi'an 710072, Shaanxi, China

²Department of Traditional Chinese Medicine, Shaanxi Second Provincial People's Hospital, Xi'an 710005, Shaanxi, China

*Correspondence Author

Abstract: ***Objective:** By applying data mining to analyze the medication rules in Li Dongyuan's Lanshi Micang Ulcer and Sore, to improve the clinical efficacy of the treatment of sore and ulcer. **Methods:** Collect and organize 15 prescriptions of Chinese medicine and 4 prescriptions of external Chinese medicine, and conduct high-frequency statistics, correlation analysis, cluster analysis and visualization of Chinese medicine use. **Results:** 46 Chinese medicine appeared in 14 TCM prescriptions, and the total frequency was 190 times. A total of 15 flavors used more than 5 times, angelica, licorice, forsythia, baicalin, Bupleurum, Astragalus, cypress, rhubarb, burdock, flax, platycodon, safflower, cinnamon, prism, etc., cold, temperature and flat, spicy, bitter and sweet, spleen, stomach, liver and lung. Common Chinese medicine for forsythia-angelica, licorice-angelica, the highest correlation coefficient; clustering analysis shows that the core drugs are 4 categories. **Conclusion:** To explore the Chinese medicine rules of Lanshi Micang Ulcer and Sore with data mining, visualized Chinese medicine property and flavor channel tropism, provide medication reference for the clinical treatment of sores and ulcer treatment and find the new prescription ideas ideas.*

Keywords: Lan Shi Mi Cang, Sores and ulcers, Data mining, Medication rules, Li Dongyuan.

1. Introduction

Lanshi Micang was published in 1276 AD. It permeates Li Dongyuan's theory regarding internal injury to the spleen and stomach, which serves as the basis for studying his academic theories [1-3]. The "Ulcer and Sore" section in Lanshi Micang contains 19 prescriptions for the surgical treatment of ulcers and sores, among which 15 are for internal treatment and 4 for external treatment [4]. The chapter Sores posits that the causes of ulcers and sores are associated with the stagnation of nutrient qi and defensive qi, blood stasis, and disharmony of the spleen and stomach. In clinical practice, medications are prescribed in light of the pathogenesis, with an emphasis on internal injury to the spleen and stomach. When ulcers and sores occur in different locations related to meridians, treatment should be carried out based on meridian differentiation, thus forming Li's unique treatment system. This paper applies data mining to medical research, collates Li Dongyuan's academic ideas on surgical treatment, uncovers the implicit knowledge and medication patterns in ancient books, and provides a reference for the use of oral traditional Chinese medicine in the clinical diagnosis and treatment of ulcers and sores.

2. Materials and Methods

2.1 Data Sources and Processing

The data were derived from the "Lanshi Micang Ulcer and Sore" published in 2019. Focusing primarily on decoction formulations, a total of 19 ulcer-treating prescriptions were collected and organized, including 15 internal-use formulas and 4 external-use formulas. Analyses were conducted on the properties, flavors, meridian tropisms, frequency of use of the Chinese herbs, and the association rules between herbs to identify high-frequency drugs. The herbs in the prescriptions were standardized in accordance with the "Pharmacopoeia of

the People's Republic of China" (2020 Edition) and "Zhonghua Bencao" (Chinese Materia Medica). For example, "Zhonggui" was standardized to "Guizhi" (Ramulus Cinnamomi), "Shunianzi" to "Niubangzi" (Fructus Arctii), "Zhigancao" (processed Radix Glycyrrhizae) and "Shenggancao" (raw Radix Glycyrrhizae) to "Gancao" (Radix Glycyrrhizae), and "Danggui Shao" (apical part of Radix Angelicae Sinensis) and "Danggui Shen" (main body of Radix Angelicae Sinensis) to "Danggui" (Radix Angelicae Sinensis).

2.2 Data Analysis

The traditional Chinese medicine components of the 15 prescriptions were input into Excel 2019. After standardization, the prescriptions were re-examined to ensure data accuracy. Subsequently, data analysis was carried out. For frequency analysis, as well as the analysis of the nature, flavor, and meridian tropism of the herbs, statistical methods such as auto-sorting, sum formulas, and pivot tables were employed. After the standardization process, the representative herbs were assigned values according to the rule of "1 = Y, 0 = N" to establish a sparse matrix table of drug attributes. The Apriori association analysis model was established using SPSS Modeler 18 software. The minimum support was set at 30%, the minimum confidence level at 70%, and the maximum number of antecedents at 2. The resulting association rules were then exported. The confidence level can reveal the degree of association between drugs in the prescriptions, indicating the probability that the presence of drug A in a prescription implies the presence of drug B [5]. SPSS Statistic 25 software was used to perform cluster analysis on the top 20 ranked traditional Chinese medicines. Hierarchical cluster analysis, which is a method for classifying research objects based on their homogenization, was applied. Based on the strength of the association relationships, core herb pairs, commonly-used drug

combinations, and core formulas were extracted.

3. Results

3.1 Frequency Analysis Results

A total of 15 TCM prescriptions were analyzed, comprising 46 distinct medicinal ingredients and collectively containing 190 herb occurrences. The 15 most frequently used herbs — accounting for 130 occurrences (68.4% of the total) — were ranked in descending order of frequency as follows: *Angelica sinensis* (15), *Glycyrrhiza uralensis* (14), *Forsythia suspensa* (14), *Scutellaria baicalensis* (12), *Bupleurum chinense* (9), *Astragalus membranaceus* (9), *Phellodendron chinense* (8), *Rehmannia glutinosa* (7), *Cimicifuga foetida* (7), *Coptis chinensis* (7), *Arctium lappa* (7), *Platycodon grandiflorus* (6), *Carthamus tinctorius* (5), *Cinnamomum cassia* (5), and *Sparganium stoloniferum* (5). (See Figure 1)

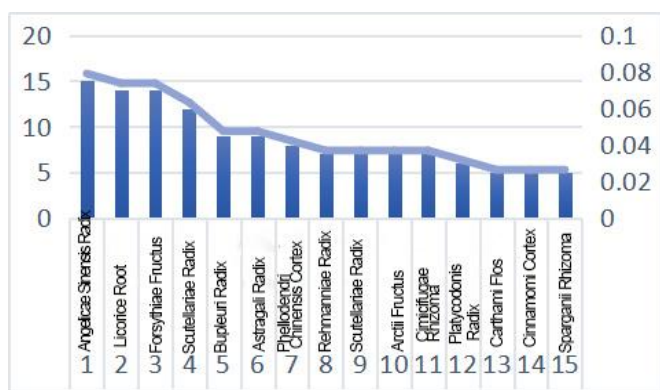


Figure 1: Frequencies and Proportions of the Top 15 High-frequency Medicinal Herbs

3.2 Nature-Flavor-Meridian Tropism Statistics

A statistical analysis of the four natures, five flavors, and meridian tropism of the 46 Chinese herbs was conducted. Among the four natures, cold and warm herbs were used more frequently. In terms of flavors, pungent, bitter, and sweet herbs were dominant. Regarding meridian tropism, the herbs mainly targeted the spleen, liver, lung, and stomach meridians. (See Figure 2, Figure 3, Figure 4)

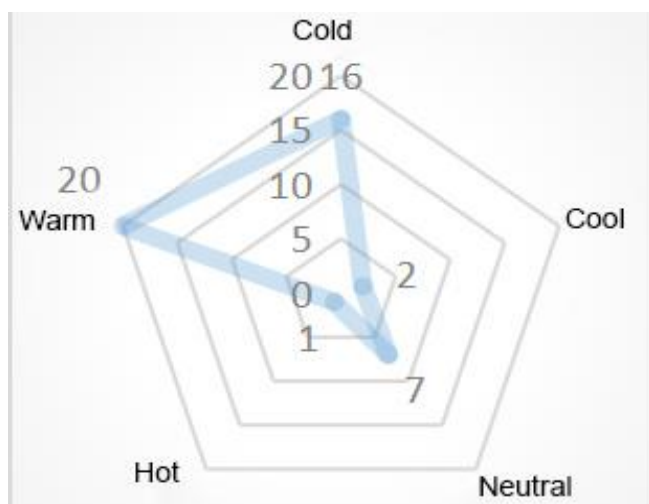


Figure 2: Four Natures Radar Chart



Figure 3: Five Flavors Radar Chart

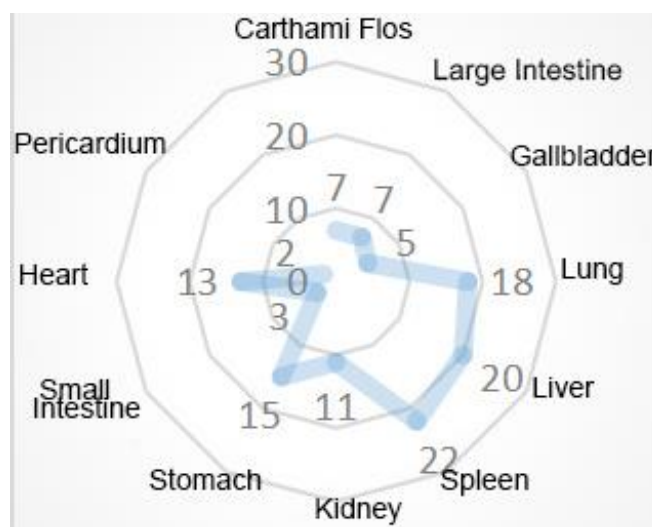


Figure 4: Meridian Tropism Radar Chart

3.3 Results of Association Rule Analysis

The SPSS Clementine 18.0 association rule software was used to analyze the association rules of the drugs in the internal-use formula database. Herb pairs with a support degree greater than 30% were selected, and the minimum confidence level was set at 70%. The network diagram can vividly show the association relationships and their intensities among various drugs. The analysis showed that the number of valid transactions was 246, the minimum support was 31.25%, the maximum support was 93.75%, the minimum confidence level was 71.42%, and the maximum confidence level was 100%. A lift greater than 1 indicates that the rule is meaningful. The herb pairs with a relatively high two-item association support degree included *Forsythia suspensa* - *Angelica sinensis*, *Glycyrrhiza uralensis* - *Angelica sinensis*, *Angelica sinensis*-*Glycyrrhiza uralensis*, *Angelica sinensis* - *Forsythia suspensa*, *Glycyrrhiza uralensis* - *Forsythia suspensa*, etc. The herb pairs with a relatively high three-item association support degree included *Glycyrrhiza uralensis* - *Forsythia suspensa* + *Angelica sinensis*, *Forsythia suspensa* - *Glycyrrhiza uralensis*, *Forsythia suspensa* - *Scutellaria baicalensis* + *Glycyrrhiza uralensis*, etc. An Apriori model was established for data association rule analysis, and a complex network diagram was obtained. (See Figure 5, Table 1)

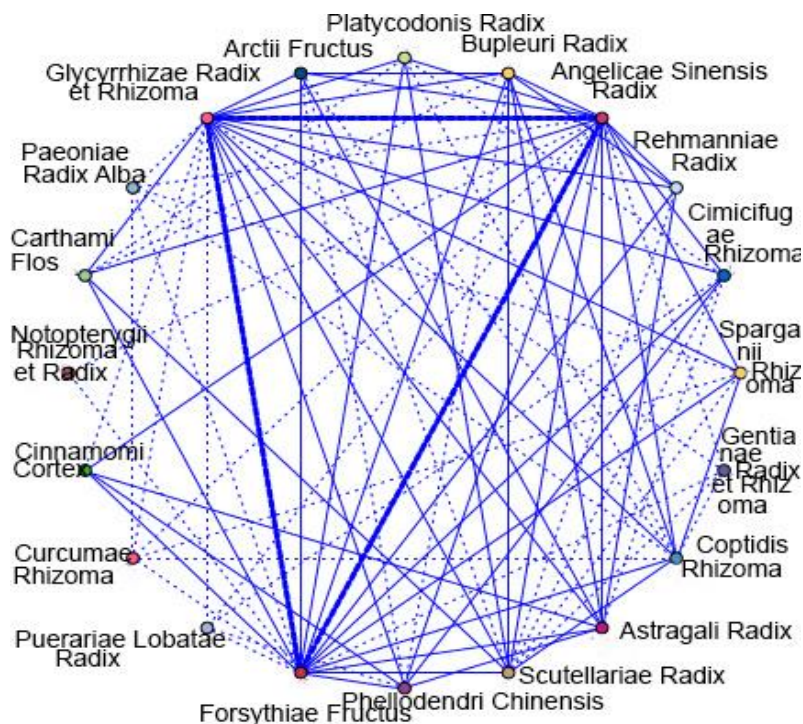


Figure 5: Association diagram of support degree of internal-use drugs

Table 1: Distribution of association rules (the first 20 groups)

Consequent	Antecedent	Instances	Support (%)	Confidence (%)
Forsythia suspensa	Angelica sinensis	15	93.75	93.33
Glycyrrhiza uralensis	Angelica sinensis	15	93.75	86.67
Angelica sinensis	Forsythia suspensa	14	87.50	100.00
Glycyrrhiza uralensis	Forsythia suspensa	14	87.50	92.86
Glycyrrhiza uralensis	Forsythia suspensa + Angelica sinensis	14	87.50	92.86
Forsythia suspensa	Glycyrrhiza uralensis	13	81.25	100.00
Angelica sinensis	Glycyrrhiza uralensis	13	81.25	100.00
Angelica sinensis	Glycyrrhiza uralensis + Forsythia suspensa	13	81.25	100.00
Forsythia suspensa	Glycyrrhiza uralensis + Angelica sinensis	13	81.25	100.00
Angelica sinensis	Astragalus membranaceus	9	56.25	100.00
Glycyrrhiza uralensis	Scutellaria baicalensis	9	56.25	100.00
Angelica sinensis	Bupleurum chinense	9	56.25	100.00
Forsythia suspensa	Scutellaria baicalensis + Glycyrrhiza uralensis	9	56.25	100.00
Glycyrrhiza uralensis	Scutellaria baicalensis + Forsythia suspensa	9	56.25	100.00
Angelica sinensis	Scutellaria baicalensis + Glycyrrhiza uralensis	9	56.25	100.00
Glycyrrhiza uralensis	Scutellaria baicalensis + Angelica sinensis	9	56.25	100.00
Angelica sinensis	Scutellaria baicalensis + Forsythia suspensa	9	56.25	100.00
Forsythia suspensa	Scutellaria baicalensis + Angelica sinensis	9	56.25	100.00
Angelica sinensis	Bupleurum chinense + Forsythia suspensa	9	56.25	100.00
Forsythia suspensa	Scutellaria baicalensis	9	56.25	100.00
Angelica sinensis	Scutellaria baicalensis	9	56.25	100.00
Forsythia suspensa	Bupleurum chinense	9	56.25	100.00

3.4 Results of Cluster Analysis

SPSS Statistic 26 software was used to perform hierarchical cluster analysis on high-frequency herbs (frequency ≥ 4). A binary variable analysis was used to generate a dendrogram. For the top 20 herbs, R-type clustering was adopted. Finally, combined with theory, 4 core drug combinations were obtained: C1: Paeonia lactiflora, Curcuma phaeocaulis, Sparganium stoloniferum, Coptis chinensis, Gentiana scabra, Cimicifuga foetida, Pueraria lobata; C2: Glycyrrhiza uralensis, Forsythia suspensa, Scutellaria baicalensis, Platycodon grandiflorus, Carthamus tinctorius; C3: Phellodendron chinense, Cinnamomum cassia, Notopterygium incisum, Astragalus membranaceus; C4: Bupleurum chinense, Arctium lappa, Rehmannia glutinosa, Angelica sinensis. Drug cluster analysis can conduct convergent statistics on drugs. (See Figure 6)

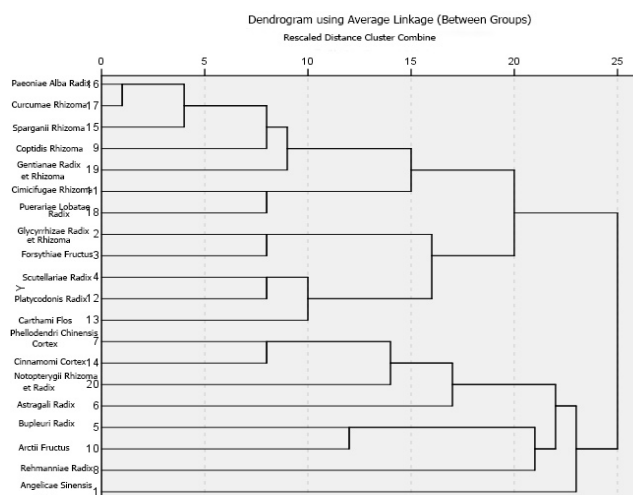


Figure 6: Dendrogram of internal-use drugs

4. Discussion

Sores and ulcers refer to purulent infectious diseases on the body surface or under the skin of the human body affected by various pathogenic factors, which are common diseases in traditional Chinese surgical science [6]. The pathogenesis is related to qi and blood stagnation, meridian obstruction, loss of control of nutrient qi and defensive qi, and visceral deficiency, leading to yin-yang imbalance. The treatment methods for sores and ulcers include dissipation, support, and supplementation. Modern dermatology has supplemented treatment methods such as “tonifying deficiency and removing blood stasis” and “supporting toxin, strengthening the root, and tonifying the healthy qi” [7].

4.1 Analysis of High-Frequency Herbs and Four Natures and Five Flavors

Based on data mining, the three herbs with the highest frequency of occurrence in Lanshi Micang Ulcer and Sore are *Angelica sinensis*, *Glycyrrhiza uralensis*, and *Forsythia suspensa*. The total frequency of the top 15 high-frequency herbs accounts for 68.4% of all herbs. *Angelica sinensis* is sweet and rich in flavor, with a light and pungent aroma. It has the functions of nourishing and promoting blood circulation, regulating menstruation, and relieving pain. It nourishes blood while also acting on the qi aspect, promoting blood circulation without harming the healthy qi. As stated in “Huang Yuanyu’s Interpretation of Materia Medica”, “*Angelica sinensis* is moist and lubricating, and is highly effective in calming wind and nourishing blood.” It mainly treats qi and blood deficiency, as well as carbuncles and sores. Li Dongyuan often used *Angelica sinensis*, the tip of *Angelica sinensis*, and the body of *Angelica sinensis*. These have the effects of harmonizing and nourishing blood, and stopping bleeding. The tip of *Angelica sinensis* moistens dryness and harmonizes blood, while the body of *Angelica sinensis* is more inclined to harmonize and nourish blood, and nourish liver blood. Wang Fenglong et al. [8] reviewed recent studies and found that *Angelica sinensis* can treat various inflammatory and painful diseases. It can inhibit the release of pain-causing substances such as inflammatory factors and chemokines in the body, or block the amplification and transmission of pain sensations to exhibit analgesic activity. *Angelica sinensis* polysaccharide can inhibit various inflammatory pains. The volatile oil of *Angelica sinensis* can partially inhibit the systemic inflammatory response by regulating the metabolic network. The alcohol-extracted oil of *Angelica sinensis* has certain anti-inflammatory activity and can inhibit edema in the early stage of inflammation and tissue hyperplasia in the late stage. Ferulic acid can inhibit the inflammatory response and has an analgesic effect. It relieves pain by blocking the δ -opioid receptor and controlling the spinal monoaminergic system. *Glycyrrhiza uralensis* enters the Foot-Taiyin Spleen Meridian and Foot-Yangming Stomach Meridian. As the saying goes, “The recovery of sores depends entirely on the spleen earth, and careful regulation is essential.” *Glycyrrhiza uralensis* invigorates the spleen, replenishes qi, nurtures the spleen earth, and can also harmonize various herbs. It clears heat and purges fire to treat sores and ulcers. According to “Huang Yuanyu’s Interpretation of Materia Medica”, “Use the head for upward movement and the tip for downward movement... For all cases of sore throat and hot swelling of sores, raw

Glycyrrhiza uralensis should be used to purge the stagnant fire.” One of the active substances of *Glycyrrhiza uralensis*, glycyrrhizin, can inhibit the formation of inflammatory mediators. It has pharmacological functions such as anti-virus, anti-inflammation, antibacterial, and nerve-protecting effects. Clinically, it can be used to treat ulcers, hepatitis, cancer, AIDS, herpes, and other diseases [9]. *Forsythia suspensa* has the functions of clearing heat, detoxifying, reducing swelling, and resolving masses. It is known as the “sacred herb for sores” and is effective against gonorrhea, erysipelas, inflammation, fever, ulcers, and other diseases. As stated in Lanshi Micang Ulcer and Sore, “*Forsythia suspensa* is an essential herb for sores in the twelve meridians. It can disperse blood stasis and qi stagnation, and is a miraculous herb for sores.” And as described in “Huang Yuanyu’s Interpretation of Materia Medica”, “*Forsythia suspensa* is good at removing stagnant heat, especially capable of promoting blood circulation, dredging the meridians, cooling the nutrient-blood aspect, resolving masses, treating carbuncles and scrofula, and excelling in reducing swelling and expelling pus.” *Forsythia suspensa* has an anti-inflammatory effect on a variety of pathogenic bacteria, and forsythoside A has anti-inflammatory and antioxidant effects [10].

The statistical results of the four natures and five flavors indicate that cold-natured and warm-natured herbs are used more frequently, with neutral-natured herbs as supplements. Among the flavors, pungent, bitter, and sweet herbs are dominant. In the treatment of ulcers and sores, bitter-cold herbs can clear heat, detoxify, cool the blood, and purge fire, while pungent-warm herbs can disperse the exterior, promote qi circulation, and activate blood flow. The combination of pungent-warm dispersion, sweet-warm tonification of the qi of the spleen and lung, and the use of bitter-cold herbs for clearing and eliminating is adopted. Employing both cold and warm herbs, integrating attacking and tonifying methods, strengthening the healthy qi, expelling toxins, reducing swelling, and discharging pus represent the overall treatment approach, which is consistent with the general therapeutic principles of dissipation, reinforcement, and supplementation. The meridian tropism reflects Li Dongyuan’s emphasis on the spleen and stomach as the central pivot and the theory of qi circulation. He treated ulcers and sores by regulating the qi mechanisms of the liver and lungs. In the human body, the central qi generates the spleen-earth qi. The spleen qi ascends on the left to warm the liver-wood qi and nourish the heart-fire qi. The liver qi ascends on the left, and the liver governs dispersion, promoting the ascending qi. The central qi descends on the right to generate the stomach qi. Through the transformation from yang to yin, the lung qi descends on the right to generate the kidney-water qi. The lung governs dispersion and descent, controls respiration, and the clear qi descends smoothly. These two aspects coordinate with each other to maintain the balance of the ascending and descending qi mechanisms [11, 12].

4.2 Analysis of Association Rules

The top three pairs of herbs with the highest association are *Forsythia suspensa*-*Angelica sinensis*, *Glycyrrhiza uralensis* - *Angelica sinensis*, *Angelica sinensis*-*Glycyrrhiza uralensis*, *Angelica sinensis*-*Forsythia suspensa*, and *Glycyrrhiza uralensis* - *Forsythia suspensa*. Among the three-herb

combinations, those with relatively high support degrees include *Glycyrrhiza uralensis*-*Forsythia suspensa* + *Angelica sinensis*, *Forsythia suspensa* - *Glycyrrhiza uralensis*, and *Forsythia suspensa* - *Scutellaria baicalensis* + *Glycyrrhiza uralensis*. The combination of *Forsythia suspensa* and *Angelica sinensis* combines the pungent and bitter properties. It can not only clear heat, detoxify, reduce swelling, and expel pus, but also promote blood circulation and relieve pain. *Forsythia suspensa* acts on the qi aspect, while *Angelica sinensis* acts on the blood aspect. By using herbs of cold and hot natures together, it has the functions of dispersion and movement. The combination of *Forsythia suspensa* and *Angelica sinensis* appears in many well-known formulas. For instance, the Danggui Lianqiao Decoction in “Wanbing Huichun” has the effects of strengthening the healthy qi, expelling toxins, promoting the discharge of pus, and generating new flesh, and is used to treat hemorrhoids and anal fistulas. The Danggui Lianqiao Decoction in “Youke Leicui” is used to treat double tongue and sores on both sides of the lips and mouth. The combination of *Angelica sinensis* and *Astragalus membranaceus* can tonify qi, promote blood circulation, and nourish blood. When *Astragalus membranaceus* and *Angelica sinensis* are combined, yin and yang are integrated, and movement and stillness are appropriately balanced. This combination can tonify qi, nourish blood, and promote blood circulation, thus unblocking the channels. In the Danggui Buxue Decoction from “Neiwai Shang Bianhuo Lun”, *Astragalus membranaceus* is sweet in flavor and neutral in nature, tonifying the qi of the spleen and lungs. When combined with *Angelica sinensis*, it can tonify both qi and blood. *Astragalus membranaceus* can regulate immune function and body metabolism. It achieves the effect of promoting blood circulation by reducing blood viscosity and has pharmacological effects such as anti-inflammation, anti-organ and tissue fibrosis, anti-oxidative stress, and protection of cardiac function [13]. The combination of *Forsythia suspensa*, *Angelica sinensis*, and *Bupleurum chinense* can soothe the liver, harmonize blood, relieve depression, and clear heat. *Bupleurum chinense* purges the stagnant heat in the Shaoyang gallbladder and liver meridians. *Angelica sinensis* nourishes and promotes blood circulation, and *Forsythia suspensa* disperses blood stasis and qi stagnation in sores and ulcers, reducing swelling and expelling pus. As stated in “Huang Yuanyu’s Materia Medica Interpretation”, “*Bupleurum chinense* is bitter in flavor and slightly cold in nature, entering the Foot-Shaoyang Gallbladder Meridian. It clears the stagnant fire in the gallbladder meridian and purges the vexing heat in the heart.” *Bupleurum chinense* has pharmacological effects such as anti-inflammation, anti-cancer, anti-depression, and protection of the heart, liver, and kidneys. It regulates the body’s self-healing mechanism by modulating signal pathways such as the apoptosis, inflammation, oxidative stress, and fibrosis signal pathways [14].

4.3 Analysis of Core Drug Combinations

Core Formula C1: Comprising *Paeonia lactiflora*, *Curcuma phaeocaulis*, *Sparganium stoloniferum*, *Coptis chinensis*, *Gentiana scabra*, *Cimicifuga foetida*, and *Pueraria lobata*, this is a modified version of the Sanzhong Kuijian Decoction. It is used for treating scrofula-like sores and tuberculous

lymphadenitis, with the effects of purging fire, relieving pain, reducing swelling, and resolving firm masses. Both *Coptis chinensis* and *Gentiana scabra* are bitter-cold herbs that can clear ministerial fire. As stated in “Changsha Yaojie”, “*Coptis chinensis* is bitter in taste and cold in nature, entering the Hand-Shaoyin Heart Meridian. It clears the heart, reduces fever, purges fire, and relieves vexation.” *Gentiana scabra* clears the stagnant heat in the liver and gallbladder. *Pueraria lobata* and *Cimicifuga foetida* can elevate yang and detoxify. *Cimicifuga foetida* relieves sore-throat pain, reduces swelling, and expels pus. *Paeonia lactiflora* soothes the liver and relieves pain, “entering the liver to calm the wind and going to the gallbladder to clear heat.” *Curcuma phaeocaulis* and *Sparganium stoloniferum* can promote qi circulation, break blood stasis, break through stagnation, and resolve masses, and are applicable to treating blood stasis caused by traumatic injuries, as well as sores, ulcers, and carbuncles.

Core Formula C2: Consisting of *Glycyrrhiza uralensis*, *Forsythia suspensa*, *Scutellaria baicalensis*, *Platycodon grandiflorus*, and *Carthamus tinctorius*, it implies the Lianqiao Xiaodu Decoction from “Waike Zhengzong”. This formula has the functions of clearing heat, detoxifying, promoting blood circulation, resolving blood stasis, and dissipating masses, and is used for treating scrofula due to heat-toxin, as well as swollen lymph nodes on the cheeks and neck. *Glycyrrhiza uralensis* clears heat, detoxifies, harmonizes various herbs, tonifies qi, and regulates the middle-jiao. *Forsythia suspensa* clears heat, detoxifies, disperses blood stasis and qi stagnation in sores and ulcers, and reduces swelling and expels pus. *Platycodon grandiflorus* and *Trichosanthes kirilowii* clear heat and expel pus. *Platycodon grandiflorus* can guide other herbs upward. *Platycodin*, an active ingredient of *Platycodon grandiflorus*, exhibits significant pharmacological effects such as antibacterial, anti-inflammatory, anti-tumor, immunomodulatory, expectorant, and antitussive effects, thus being used in the treatment of sores and ulcers [15].

Core Formula C3: Composed of *Phellodendron chinense*, *Cinnamomum cassia*, *Notopterygium incisum*, and *Astragalus membranaceus*, it implies the Huangqi Chaihu Decoction from “Yanke Xinde Ji · Buyi”. This formula has the effects of promoting blood stasis resolution, dredging collaterals, clearing heat, and removing dampness. *Phellodendron chinense* is used for the Hand-Taiyang Meridian. It can “drain the damp-heat of the spleen, clear the stagnant heat of the liver, regulate heat, and relieve tenesmus.” *Cinnamomum cassia* warms the liver, nourishes blood, and breaks blood stasis. *Cinnamomum cassia* contains volatile oil components and has pharmacological effects such as anti-inflammation, anti-tumor, antibacterial, antipyretic, and analgesic effects [16].

Core Formula C4: Containing *Bupleurum chinense*, *Arctium lappa*, *Rehmannia glutinosa*, and *Angelica sinensis*, it implies the Chaihu Qinggan San from “Waike Zhengzong”. This formula has the functions of clearing the liver and gallbladder, detoxifying, purging fire, removing dampness, and dredging collaterals. *Bupleurum chinense* in the Shaoyang Meridian can guide herbs into the liver meridian. *Arctium lappa* dispels wind, removes dampness, reduces swelling, and expels toxins, and is clinically used to treat erysipelas, carbuncles, and other

sores. *Arctium lappa* has effects such as anti-inflammation, anti-oxidation, anti-cancer, anti-ulcer, anti-infection, cardiovascular protection, and immune regulation [17].

5. Medicinal Thought in Lanshi Micang Ulcer and Sore

As stated in “Wai Ke Qi Xuan” There are six exogenous pathogenic factors in nature, namely wind, cold, summer-heat, dampness, dryness, and fire. When a person is affected by them, the nutrient qi fails to flow smoothly, goes against the muscle texture, and gives rise to carbuncles, ulcers, boils, and furuncles.” When the nutrient qi and defensive qi lose their normal function, exogenous pathogenic toxins penetrate into the interior and invade the nutrient qi. Damp-heat accumulates, blood stasis remains, turns into putrefaction, and forms pus, thus leading to the occurrence of sores and ulcers. Improper diet can cause deficiency of the spleen and stomach, generate internal yin-fire, disrupt the balance of nutrient qi and defensive qi, and make the nutrient qi flow reversely, blocking the meridians and pores, which also results in sores and ulcers. Li Dongyuan believed that sores and ulcers are caused by local qi and blood stagnation in the skin or meridian obstruction. Exogenous pathogenic factors include exposure to the six exogenous pathogenic factors, infection by special toxins, and trauma, while internal factors include emotional stress, over-fatigue from diet and labor, and sexual over-indulgence. The treatment principles for sores and ulcers are to harmonize the nutrient qi, unblock the meridians, resolve blood stasis, eliminate stagnation, clear heat, moisten dryness, expel wind, and remove dampness. Meanwhile, emphasis is placed on “tonifying the spleen and stomach and protecting the original qi”, highlighting the relationship between the spleen and stomach and the nutrient qi and defensive qi. Damage to the spleen and stomach leads to deficiency of the original qi, which in turn causes diseases [18]. As mentioned in Plain Questions: On the Unity of Qi in Living Things and Nature (Su Wen Sheng Qi Tong Tian Lun), “When the nutrient qi fails to flow smoothly and goes against the muscle texture, carbuncles will occur.” The cause of sores and ulcers is disharmony and blockage of the nutrient qi and defensive qi, resulting in qi and blood stasis in the skin. Over time, putrefaction occurs and pus forms [19]. Based on this, Li Dongyuan established the treatment theory for sores and ulcers, stating that “the key to treating sores is to understand the three methods of supporting the interior, dredging, and regulating the nutrient qi and defensive qi.” The primary approach in treating sores and ulcers is to protect the spleen and stomach, regulate the original qi, and the nutrient qi and defensive qi to restore the body’s regenerative ability. The nutrient qi is generated from the stomach qi. The middle-jiao, where the spleen and stomach are located, is the hub of the body’s qi movement. When the spleen qi ascends, essential qi is distributed; when the stomach qi descends, dampness is removed. With the harmonious function of the internal organs, the nutrient qi flows smoothly, the meridians are unobstructed, and the healthy qi can resist exogenous pathogens, preventing the occurrence of sores and ulcers. Among the 15 internal-treatment formulas for sores and ulcers in the book, 9 formulas focus on protecting the spleen and stomach and regulating the original qi. For example, “For those with inherently weak qi, bitter-cold herbs should be removed, and more herbs like ginseng, astragalus, and licorice should be

added. First, tonify the original qi before purging fire.” Astragalus and ginseng are commonly used herb combinations by Li Dongyuan. They are important herbs for removing heat with sweet-warm herbs, tonifying qi, and strengthening the spleen, embodying the concept that “visible blood cannot be generated by itself”, and qi is tonified first to promote blood production [20].

Li Dongyuan emphasized to patients the importance of dietary taboos. Improper diet can lead to insufficient nourishment of the spleen and stomach. Consuming raw and cold foods may damage yang qi, weakening the healthy qi and making the body vulnerable to exogenous pathogens. He believed that spices, dried ginger, alcohol, and spicy foods can promote the production of damp-heat, causing damp-heat to pour downward and heat pathogens to consume body fluids. In the book, statements such as “Avoid raw and cold foods”, “Take medicine warm after meals”, “Avoid raw, cold, and hard foods, as well as cold water and cold vegetables”, and “Do not over-medicate to avoid interfering with diet, which is a fundamental principle of treatment” are emphasized. When the residual toxins remain after the sores and ulcers rupture, it is necessary to nourish the qi of the spleen and stomach, ensure a reasonable and nutritious diet, strengthen the spleen, and nourish the stomach to ensure an abundant supply of qi and blood, thereby promoting the growth of new flesh, wound closure, and healing. Tonifying the spleen and stomach, clearing yang, purging yin-fire, and paying attention to dietary taboos address the root causes of the disease, such as promoting digestion to remove stagnation, differentiating and draining dampness, or expelling wind and removing dampness. His academic ideas are equally applicable in modern society [21].

In Lanshi Micang Ulcer and Sore, herbs with the efficacy of reducing swelling and resolving masses include *Sparganium stoloniferum*, *Curcuma phaeocaulis*, *Arctium lappa*, *Angelica dahurica*, *Forsythia suspensa*, and *Ecklonia kurome*. Reducing swelling, softening hardness, and resolving masses is an important therapeutic approach for treating visible diseases such as carbuncles, sores, and masses. By reducing swelling and resolving masses locally, sores and ulcers can be dissipated. Lanshi Micang Ulcer and Sore relieves pain through four therapeutic methods: promoting meridians-circulation with pungent-warm herbs, promoting qi-movement with bitter-cold herbs, resolving blood stasis and harmonizing nutrient-qi, and tonifying qi and nourishing blood [19]. In Jiuku Huajian Decoction, *Saposhnikovia divaricata* unblocks the meridians, dispels dampness, and relieves pain. It acts on the Taiyang Meridian, eliminating wind-pathogens in the head and upper-jiao. *Cinnamomum cassia*, being pungent, warm, and hot in nature, can resolve masses and eliminate accumulations. For yin-type sores and ulcers, it is used according to syndrome-differentiation and treatment based on the principle of using heat to counteract cold. In Neishu Huanglian Decoction, *Forsythia suspensa*, *Scutellaria baicalensis*, *Coptis chinensis*, and *Gardenia jasminoides*, which are bitter-cold, clear heat and dry dampness. *Aucklandia lappa* and *Areca catechu* promote qi-movement, while *Angelica sinensis* and *Paenonia lactiflora* harmonize blood. The combination of bitter-cold herbs to dry dampness and promote qi-movement relieves pain. In Shunianzi Decoction, *Typha angustifolia* and *Prunus persica*

are used to promote blood circulation and remove blood stasis, along with a small amount of *Carthamus tinctorius* to unblock the meridians and relieve stasis in sores [22]. In Huanglian Xiaodu Decoction, a small amount of *Caesalpinia sappan* is used in combination with herbs that tonify qi and nourish blood, so as to remove blood stasis without harming the healthy qi. In Danggui Huangqi Decoction, *Astragalus membranaceus* tonifies qi and expels toxins. As stated in Huang Yuanyu's *Materia Medica Interpretation*, "It easily reaches the skin and pores, specifically unblocks the muscle surface... For all sores and ulcers, inward-collapse should always be avoided, and *Astragalus membranaceus* is suitable." Siwu Decoction promotes and nourishes blood to tonify qi and blood and relieve pain.

In *Lanshi Micang Ulcer and Sore*, for the syndrome-differentiated treatment of scrofula and scrofula-like masses, Jiuku Huajian Decoction is used. The treatment principle involves invigorating qi, promoting blood circulation, strengthening the spleen, resolving masses, and eliminating sores. It combines the application of herbs corresponding to the three-jiao and treatment based on the differentiation of meridians. Li Dongyuan utilized processing methods to mitigate the bitter-cold nature of herbs, enabling them to more precisely reach the three-jiao according to their action tendencies. In the treatment of sores and ulcers, herbs are selected following the meridians. For example, *Scutellaria baicalensis*, after being stir-fried with wine, ascends to the upper-jiao to clear the damp-heat in the lungs. *Coptis chinensis* acts on the middle-jiao, removing damp-heat in the spleen and stomach and purging heart-fire. *Phellodendron chinense*, *Anemarrhena asphodeloides*, and *Stephania tetrandra* act on the lower-jiao, clearing damp-heat in the bladder, expelling stasis and turbidity, and regulating the liver and spleen. *Notopterygium incisum*, *Angelica pubescens*, and *Saposhnikovia divaricata* act on the Hand-and Foot-Taiyang Meridians, treating back pain, neck stiffness, etc. For scrofula along the Yangming Meridian, *Bupleurum chinense* and *Arctium lappa* are not used. For scrofula-like masses along the Shaoyang Meridian, *Sparganium stoloniferum* is added, while *Angelica pubescens*, *Rhaponticum uniflorum*, *Cimicifuga foetida*, and *Pueraria lobata* are removed.

When using wind-type herbs for meridian-specific treatment, these herbs can guide medications into specific meridians and also have the effects of ascending yang and dispersing fire. *Cimicifuga foetida* and *Bupleurum chinense* are light in flavor and can ascend, regulating the qi mechanism to elevate the spleen yang. For instance, Sanzhong Kuijian Decoction, which treats scrofula-like sores, acts on the Hand-and Foot-Shaoyang Meridians and the Foot-Yangming Meridian. Lianqiao Sanjian Decoction, used for treating scrofula, acts on the Hand-and Foot-Shaoyang Meridians. Neituo Huangqi Decoction, for treating deep-seated carbuncles, acts on the Liver Meridian and the Spleen Meridian. Wind-type herbs can lift the clear yang, cut off the generation of "yin-fire", just like Buzhong Yiqi Decoction. This formula restores the functions of the spleen in ascending the clear and the stomach in descending the turbid, replenishes qi and blood to nourish the internal organs and muscles, unblocks the qi of the liver and gallbladder, and purges the ministerial fire in the upper-jiao, thus restoring the body's qi circulation [23, 24].

Powdered medicines for external use have the advantages of easy absorption and quick onset of action. When applied externally, they can protect and astringe the wound, accelerating the healing process [25]. External-use formulas include Yishang San, Longquan San, Dusheng San, and Baosheng Jiuku San. Li Dongyuan was skilled at using mineral medicines. For example, Gypsum Rubrum, Talc, Sulfur, Realgar, and Alum usually have the effects of detoxifying, killing insects, and treating sores. Applying these mineral medicines to surgical sores can promote wound healing. Sulfur, when used externally, can detoxify, kill insects, and treat sores. It is applicable for treating scabies, tinea capitis, and yin-type carbuncles. Realgar has the functions of detoxifying, killing insects, drying dampness, resolving phlegm, and preventing malaria. As stated in *Annotations on the Classic of Materia Medica (Ben Cao Jing Shu)*, "This medicine is bitter and pungent, capable of drying dampness and killing insects, thus being an essential medicine for sores." It is often used for treating carbuncles, boils, snake and insect bites, and abdominal pain due to worm accumulation. Alum, when used externally, can detoxify, kill insects, dry dampness, and relieve itching. It can be used to treat eczema, scabies, and otorrhea.

6. Conclusion

Lanshi Micang Ulcer and Sore represents a collection of surgical prescriptions based on the theory of the spleen and stomach. It demonstrates characteristics such as treatment according to meridian differentiation, syndrome differentiation of the three-jiao, rigorous formulation of therapeutic principles, and flexible use of medications. It has established four pain-relieving methods for treating sores and ulcers, taking into account the relationships among the spleen and stomach, nutrient and defensive qi, original qi, damp-heat, yin-fire, and surgical sores and ulcers. In external treatment, it adeptly uses mineral medicines to detoxify, kill insects, and promote the scabbing and healing of traumatic wounds. Applying data-mining techniques to study the medication patterns in Li Dongyuan's work on sores and ulcers helps extract and explore his diagnostic and treatment principles for these conditions. This is valuable for organizing Li Dongyuan's academic thoughts on surgery. The concept of integrated internal and external treatment in traditional Chinese surgical science is worthy of clinical learning, application, development, and innovation.

References

- [1] Yang, Junfeng, and Pei Xiaohua. "Analysis of the Surgical Academic Thoughts and Syndrome-Treatment Rules in Li Dongyuan's *Lanshi Micang*." *Henan Traditional Chinese Medicine*, 2020, 40(3): 360-362.
- [2] Wang, Wei, Zhang Jiale, and Hou Yong. "Exploration of Li Dongyuan's Academic Thoughts on Treating Hemorrhoids Based on The Hemorrhoids and Fistulas Section in *Lanshi Micang*." *Journal of Zhejiang Chinese Medical University*, 2017, 41(1): 57-58.
- [3] Wei, Limei, Gao Luan, and Wei Yuanyuan. "Exploration of Li Dongyuan's Academic Thoughts on Diagnosing and Treating Toothache Based on The Oral, Dental, Throat and Larynx Section in *Lanshi Micang*." *Journal*

- of Gansu University of Chinese Medicine, 2020, 37(5): 38-40.
- [4] Li, Dongyuan. *Lanshi Micang*. Tianjin: Tianjin Science and Technology Press, 2012: 81-84.
- [5] Zhu, Sixun. "Exploration of the Rules of Ancient Formulas for Oral and External Use of Tuberculous Ulcers Based on Data-Mining Technology." Doctoral dissertation, Nanjing University of Chinese Medicine, 2020.
- [6] Xu, Qiang, Sun Hanchi, Liu Zhenlei, and Zhang Zhaohui. "Analysis of the Medication Rules of Internal-Treatment Empirical Prescriptions for Reducing Swelling and Expelling Pus of Sores and Ulcers in Surgical Mirror Based on the Traditional Chinese Medicine Inheritance Assistant System." *Lishizhen Medicine and Materia Medica Research*, 2021, 32(1): 223-226.
- [7] Liang, Qun, and Zhang Shuo. "Research Progress of Traditional Chinese Medicine in the Treatment of Intestinal Barrier Injury in Sepsis." *Liaoning Journal of Traditional Chinese Medicine*, 2021, 48(3): 203-206.
- [8] Wang, Fenglong, Liu Yuan, Zhang Laibin, and Lü Jieli. "Research Progress on the Anti-inflammatory and Analgesic Effects of *Angelica sinensis*." *Chinese Journal of Experimental Traditional Medical Formulae*, [Online], 1-19 (accessed on June 17, 2021).
- [9] Li, Linfei, Mao Fuying, Li Siqi, Ma Yan, Lin Lizhen, and Zhao Yunsheng. "Pharmacological Activities, Mechanisms of Action, and Application Progress of Glycyrrhizin." *Chinese Archives of Traditional Chinese Medicine*, [Online], 1-18 (accessed on July 12, 2021).
- [10] Tang, Hepeng, Che Nan, Liu Hanye, Ma Xiaofei, Li Junfeng, and Li Liangchang. "Forsythoside A Inhibits LPS-Induced Inflammation and Oxidative Stress by Inhibiting the PI3K/Akt Pathway and Activating the Nrf2/HO-1 Pathway." *Immunological Journal*, 2021, 37(5): 390-396.
- [11] Jiang, Chunyan, Song Hong, and Zheng Xiaowei. "Analysis of the Relationship between the Theory of Left-Ascending and Right-Descending and Asthma." *China Journal of Traditional Chinese Medicine and Pharmacy*, 2020, 35(11): 5443-5445.
- [12] Sun, Ru, Cai Weiran, and Teng Lei. "Discussion on the Clinical Efficacy of *Bupleurum chinense* Based on the Theory of 'Qi Circulation'." *Journal of Anhui University of Chinese Medicine*, 2021, 40(3): 3-5.
- [13] Wang, Wenyue, Liu Shan, Lü Qin, Li Hengyu, and Teng Jialin. "Research Progress on the Pharmacological Effects of the *Astragalus-Angelica* Herb Pair in Tonifying Qi and Promoting Blood Circulation." *Chinese Journal of Experimental Traditional Medical Formulae*, 2021, 27(6): 207-216.
- [14] Li, Yueyang, Lei Genping, Dong Sheng, and Feng Guanqiang. "Research Progress on the Modern Pharmacological Effects of *Bupleurum chinense*." *Journal of Hainan Medical University*, [Online], 1-15 (accessed on June 26, 2021).
- [15] Xu, Weichen, Luo Zichen, Xie Tong, Di Liuqing, Guo Qing, and Shan Jinjun. "Research Progress of *Platycodon grandiflorus* and Preliminary Analysis of the Prediction of Its Quality Markers." *Journal of Nanjing University of Chinese Medicine*, 2021, 37(2): 294-302.
- [16] Chen, Yudan, Feng Liting, and Zhou Bei. "Clinical Application and Related Analysis of *Cinnamomum cassia* Based on Data Mining." *Journal of Shaanxi University of Science & Technology*, 2020, 38(4): 58-63.
- [17] Du, Yi, Wang Xiaoyun, Chen Lun, Qi Jia, and Zhang Yufeng. "Exploration of the Pharmacological Mechanism of *Arctium lappa* Based on Network Pharmacology." *Acta Chinese Medicine*, 2020, 35(9): 1971-1975.
- [18] Wan, Qianqian, and Zheng Yu. "Academic Thoughts in Li Dongyuan's *Lanshi Micang*." *Journal of Changchun University of Chinese Medicine*, 2018, 34(3): 409-411.
- [19] Yang, Junfeng, and Pei Xiaohua. "Analysis of the Surgical Academic Thoughts and Syndrome-Treatment Rules in Li Dongyuan's *Lanshi Micang*." *Henan Traditional Chinese Medicine*, 2020, 40(3): 360-362.
- [20] Zhang, Dongwei, Yang Guanlin, and Zhao Hongyue. "Analysis of Li Dongyuan's Experience in Using *Astragalus membranaceus* and *Ginseng* in Combination." *Liaoning Journal of Traditional Chinese Medicine*, 2019, 46(5): 952-956.
- [21] Zhang, Weijian, Li Mianli, Chen Xinbo, Huang Yanzi, Li Haiwen, Li Jingwei, Kang Jianyuan, and Guo Shaoju. "Exploration of the Formula and Medication Rules in Differentiation and Treatment of Internal and External Injuries Based on Data Mining." *Journal of Guangzhou University of Chinese Medicine*, 2021, 38(2): 420-425.
- [22] Tang, Yang, Li Wenping, and Liu Ximing. "Brief Analysis of Li Dongyuan's Use of 'A Little Safflower'." *Information on Traditional Chinese Medicine*, 2018, 35(3): 45-46.
- [23] Kang, Xueliang, and Ye Yu. "Discussion on the Action Levels and Clinical Significance of Wind-type Herbs Used by Li Dongyuan." *Acta Chinese Medicine and Pharmacology*, 2021, 49(5): 70-73.
- [24] Li, Qiuhui, Huang Zhibin, and Chen Yan. "Brief Analysis of Li Dongyuan's 'Three-Dimensional Integration' Conditioning Concept of Regulating the Body, Qi, and Spirit." *Global Traditional Chinese Medicine*, 2021, 14(2): 285-287.
- [25] Zhou, Xinxin, Luo Xianqiang, Zhang Junqing, Zhang Xuguang, Li Xiumin, and Lai Weiyong. "Current Status of Research on Traditional Chinese Medicine Powders." *Hainan Medical Journal*, 2019, 30(3): 392-394.