

Exploration on acupoint-selection patterns based on data mining for the treatment of chronic atrophic gastritis

基于数据挖掘的针灸治疗慢性萎缩性胃炎用穴规律探究

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Abstract

Objective: To analyze the features and patterns of acupoint selection in acupuncture-moxibustion treatment of chronic atrophic gastritis (CAG) by data mining technique.

Methods: Relevant clinical studies published before 25 June, 2017 were searched in databases including PubMed, EMBASE, Cochrane library, Chinese Biomedical Literature Database (CBM), China National Knowledge Infrastructure (CNKI), and Wanfang Academic Journal Full-text Database (Wanfang).

Results: A total of 122 papers were included, involving 69 points. It was found that the top three points on the frequency list were Zusanli (ST 36), Zhongwan (CV 12) and Weishu (BL 21). The points selected were distributed in 11 meridians, in which the Stomach Meridian of Foot Yangming, Conception Vessel, and Bladder Meridian of Foot Taiyang ranked the top and accounted for 74.0% of the total frequency. Of the involved specific points, Five Shu-Transmitting points, crossing points and Back-Shu points ranked the top, accounting for 47.1%. The analysis of association pattern has shown that Zusanli (ST 36) and Zhongwan (CV 12) won the highest support rate in the paired groups; Zusanli (ST 36), Weishu (BL 21) and Zhongwan (CV 12) had the highest support rate among the point groups. The Five Shu-Transmitting points and the Lower He-Sea points had the highest support rate among the specific point groups.

Conclusion: The data mining results of the studies on acupuncture-moxibustion for CAG are substantially in line with the acupuncture-moxibustion treatment theories in traditional Chinese medicine. The results can reflect the acupoint selection patterns in treatment of CAG and provide reference for acupuncture-moxibustion treatment of CAG in clinic.

Keywords: Acupuncture Therapy; Moxibustion Therapy; Acupuncture-moxibustion Therapy; Gastritis, Atrophic; Data Mining; Bibliometrics

【摘要】目的: 通过数据挖掘方法分析针灸治疗慢性萎缩性胃炎(CAG)的选穴特点及规律。**方法:** 收集整理PubMed、EMBASE、Cochrane library、医学文献数据库(CBM)、中国知网(CNKI)和万方数据库(Wanfang) 2017年6月25日前发表的相关临床文献,建立针灸临床处方数据库。**结果:** 共纳入文献122篇,涉及69个穴位。针灸治疗CAG所选穴位频次位居前三位为足三里、中脘、胃俞。所选穴位分布在11条经络。所选经络频次前三位为足阳明胃经、任脉及足太阳膀胱经,共占总频次的74.0%。所选特定穴频次前三位的为五输穴、交会穴及背俞穴,共占总频次的47.1%。关联规则分析显示穴对配伍支持度最高的为足三里和中脘;穴组支持度最高的为足三里和胃俞配中脘;特定穴配伍支持度最高的为下合穴和五输穴。**结论:** 针灸治疗CAG文献的数据挖掘结果与传统中医学中针灸治疗理论基本相符,能够反映出CAG的临床选穴组合规律,可为临床针灸治疗CAG提供参考。

【关键词】 针刺疗法;灸法;针灸疗法;胃炎,萎缩性;数据挖掘;文献计量学

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Chronic atrophic gastritis (CAG) is a functional gastrointestinal disease, characterized by atrophic gastric mucosa, less gastric acid secretion and pathological epithelial changes along with intestinal metaplasia^[1]. CAG is often considered a precancerous stage of gastric carcinoma which is ranked fourth in cancer incidence and is currently the second most common cause of cancer-related deaths worldwide^[2-3]. With in-depth research on the pathogenesis, treatments for CAG have attracted a growing attention. However, there is no effective therapies available for CAG currently, except pharmacological agents such as drugs for *Helicobacter pylori* eradication, acid suppression, and nonsteroidal anti-inflammatory drugs^[4-5]. Acupuncture-moxibustion is one of the most common alternative therapies for CAG. Recent investigations in mice have demonstrated the efficacy of acupuncture-moxibustion in treating CAG^[6-8].

1 Methods

1.1 Literature resources

All literatures on acupuncture-moxibustion for CAG were searched in databases including PubMed, Embase, Cochrane library, Chinese Biomedical Literature Database (CBM), China National Knowledge Infrastructure (CNKI) and Wanfang Academic Journal Full-text Database (Wanfang) between the inception and 25 June, 2017.

1.2 Research methods

Both MeSH and free terms were used for search, including 'acupoint injection', 'acupuncture', 'acupuncture-moxibustion', 'acupuncture points', 'acupuncture therapy', 'auricular acupuncture', 'auricular plaster', 'body acupuncture', 'Pan Long needle', 'dermal needle', 'dry needling', 'ear acupuncture', 'ear seed pressure', 'electroacupuncture', 'embedding', 'embedding therapy', 'fire needle', 'moxibustion', 'wheat moxibustion', 'thermosensitive points moxibustion', 'indirect moxibustion', 'direct moxibustion', 'grain-sized moxibustion', 'Pan Long needling', 'percussopuncture', 'plum-blossom needle', 'point injection', 'bloodletting', 'scalp acupuncture', 'trigger points', 'meridians' AND 'chronic atrophic gastritis'.

1.3 Inclusion criteria

The purpose of the study was to observe the clinical efficacy of acupuncture-moxibustion for CAG; diagnostic criteria of CAG were clearly defined; the diagnostic criteria and efficacy evaluation standards should be internationally or at least domestically recognized; acupuncture-moxibustion was the main treatment and had positive effect; point prescriptions were clearly described.

1.4 Exclusion criteria

Acupuncture-moxibustion was used as an adjunctive treatment; Chinese herbal medications were included;

point prescriptions were not described in specific; duplicate publications or repeated literatures were counted only once.

1.5 Literature search

Title of the study, first author, year of publishing, study design, intervention of each group, quality of the study, diagnosis criteria, number of participants, participants' age, outcomes, treatment duration and adverse events were independently extracted by two reviewers (Li ZX and Huang RZ). Disagreements were resolved by discussion between the two reviewers or by seeking the opinion of a third author (Huang DY) if necessary. A total of 180 articles were collected by computer retrieval, and 122 eligible ones were finally recruited for data mining^[9-130] (Figure 1).

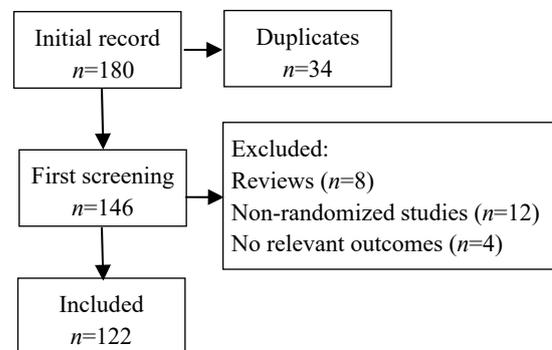


Figure 1. Flow chart of data selection

1.6 Data standardization and database establishment

Data standardization: The descriptions of points and meridians were normalized by referring to *Science of Acupuncture and Moxibustion*^[131].

Database establishment: The Microsoft Excel was used to establish the acupuncture-moxibustion prescription for CAG database and then information would be imported into SPSS version 20.0 and SPSS Modeler version 14.1.

Statistic software: Descriptive analysis was performed using SPSS version 20.0. Association rules were analyzed by SPSS Modeler 14.1.

1.7 Data mining algorithms

The association rule is to reflect the knowledge of the dependence or association between events in a data set. The important feature of association rules is a 'natural association combination'^[132]. The association rule describes the regulation and pattern of the concurrency of certain features of a subject, aiming to discover the associations and rules. The support and confidence rates are most commonly used to prove the effectiveness of an association rule. The rate of support stands for the prevalence of the rule and the rate of confidence reflects the predicted intensity. By digging the implicit knowledge hidden in the treatment information, it can provide evidence for doctors when making decisions in using acupuncture treatment.

2 Results and Analysis

2.1 Descriptive analysis results

2.1.1 Acupoint frequency analysis

A total of 69 points were calculated for acupoint frequency with a total frequency of 711. In their ranking order, the top points were Zusanli (ST 36), Zhongwan (CV 12) and Weishu (BL 21), (Figure 2).

2.1.2 Meridian selection analysis

Acupuncture-moxibustion for CAG basically involved nine ordinary meridians, Governor Vessel and Conception Vessel. The total frequency of selection of yang meridians was 58%, and that of yin meridians was 22%. Among the meridians used for CAG, Stomach Meridian, Conception Vessel, Bladder Meridian and

Spleen Meridian have been used 573 times, accounting for 83% of the total frequency; 41 points from these meridian have been used, accounting for 67% of the total frequency. The top three meridians used most frequently were Stomach Meridian (27.0%), Conception Vessel (24.3%) and Bladder Meridian (22.7%), (Table 1).

2.1.3 Specific acupoint frequency analysis

Specific points in the acupuncture-moxibustion prescription for CAG are shown in Table 2. The Five Shu-Transmitting points, with a frequency of 176 times, accounting for 16.0% of the total frequency of specific points, were most frequently used amidst the specific points. In the ranking order, the top points were Zusanli (ST 36), Taichong (LR 3) and Yinlingquan (SP 9), (Table 2).

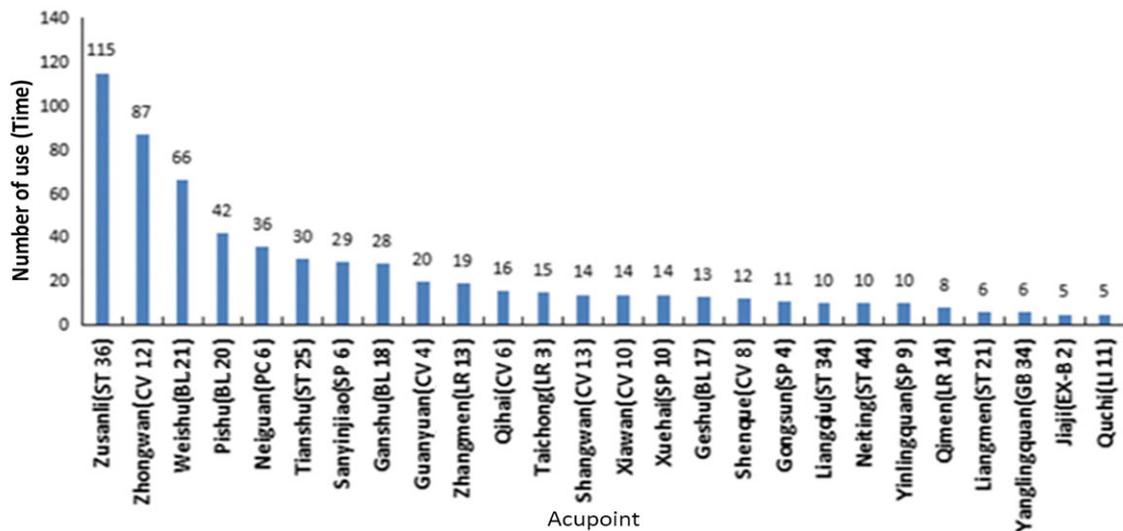


Figure 2. The frequently used points for treatment of CAG

Table 1. Point-meridian correlation in acupuncture-moxibustion treatment of CAG

Meridian	Frequency		Acupoint		Points selected (Top 3)
	Count	Percentage (%)	Number	Percentage (%)	
Stomach	189	27.0	18	27.9	Zusanli (ST 36), Tianshu (ST 25) and Liangqiu (ST 34)
Conception	170	24.3	10	13.1	Zhongwan (CV 12), Guanyuan (CV 4) and Qihai(CV 6)
Bladder	159	22.7	8	14.8	Weishu (BL 21), Pishu(BL 20) and Ganshu (BL 18)
Spleen	71	10.2	9	11.5	Sanyinjiao (SP 6), Xuehai (SP 10) and Gongsun (SP 4)
Liver	44	6.3	4	6.6	Zhangmen (LR 13), Taichong (LR 3) and Qimen (LR 14)
Pericardium	39	5.6	2	3.3	Neiguan (PC 6), Quze (PC 3)
Large Intestine	8	1.1	3	4.9	Quchi (LI 11), Hegu (LI 4) and Shousanli (LI 10)
Kidney	8	1.1	5	6.6	Taixi (KI 3), Fuliu (KI 7) and Rangu (KI 2)
Gallbladder	7	1.0	2	3.3	Yanglingquan (GB 34) and Daimai (GB 26)
Governor	2	0.3	2	4.9	Baihui (GV 20) and Mingmen (GV 4)
Triple Energizer	2	0.3	1	3.3	Zhigou (TE 6)

Table 2. Analysis of the specific points for CAG

Specific point type	Frequency		Points selected (Top 3)
	Count	Percentage (%)	
Five Shu-Transmitting points	176	16.0	Zusanli (ST 36), Taichong (LR 3) and Yinlingquan (SP 9)
Eight Influential points	175	15.9	Zhongwan (CV 12), Zhangmen (LR 13) and Geshu (BL 17)
Crossing points	167	15.2	Zhongwan (CV 12), Sanyinjiao (SP 6) and Guanyuan (CV 4)
Front-Mu points	166	15.1	Zhongwan (CV 12), Tianshu (ST 25) and Guanyuan (CV 4)
Back-Shu points	158	14.4	Weishu (BL 21), Pishu (BL 20) and Ganshu (BL 18)
Lower He-Sea points	125	11.4	Zusanli (ST 36), Yanglingquan (GB 34) and Shangjuxu (ST 37)
Luo-Connecting points	51	4.6	Neiguan (PC 6), Gongsun (SP 4) and Fenglong (ST 40)
Confluent Points of the Eight Extraordinary Meridians	48	4.4	Neiguan (PC 6), Gongsun (SP 4) and Zhaohai (KI 6)
Yuan-Primary points	24	2.2	Taichong (LR 3), Taixi (KI 3) and Hegu (LI 4)
Xi-Cleft points	11	1.0	Liangqiu (ST 34) and Diji (SP 8)

2.2 Association rules analysis

The SPSS Modeler 14.1 data mining software was used to correlate the 22 points with a frequency of eight or higher. The correlation analysis results are shown in Figure 3 and Figure 4. The thicker the connection line, the stronger the association strength. Zusanli (ST 36), Zhongwan (CV 12) and Weishu (BL 21) were most strongly associated with each other, and these three points also had higher association strength with other points compared with other points. In specific points, the Five Shu-Transmitting points, Eight Influential points, Front-Mu points, and the Lower He-Sea points were most strongly associated with each other, and these four types of specific points also had higher association strength with other points compared with other specific points.

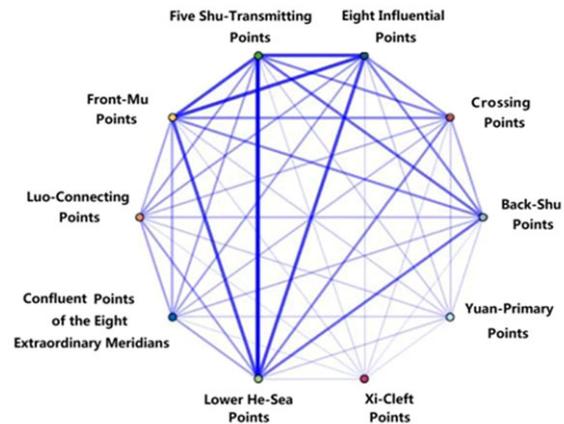


Figure 4. The frequently used specific points for CAG

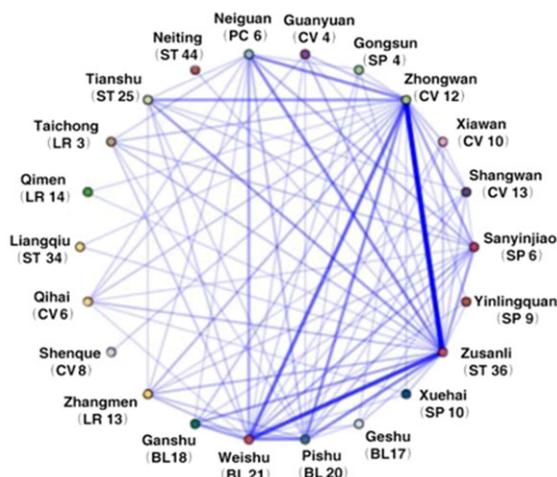


Figure 3. The frequently used points for CAG

3 Discussion

The previous studies have demonstrated that acupuncture has significant clinical efficacy for improving pathological changes and clinical symptoms in CAG patients^[84,106,133]. In traditional Chinese medicine (TCM), CAG falls into the category of ‘epigastric pain’ or ‘upper abdominal fullness and bloating’. We can find the descriptions in ancient books in the Period of Spring and Autumn (770-476 B.C) and Warring States (475-221 B.C) that ‘for diseases characterized by abdominal pain and bloating, and abdominal fullness with no appetite, apply moxibustion to the Spleen Meridian of Foot Taiyin’. In this paper, through the analysis on the literatures of acupuncture- moxibustion treatment for CAG, we have found the patterns of acupoint selection that Zusanli (ST 36), Zhongwan (CV 12) and Weishu (BL 21) were most frequently used. It is held in *Nei Jing (Classic of Internal Medicine)* that Zusanli (ST 36) is an

important point for stomach diseases. It is also said in *Ling Shu (Spiritual Pivot)* that ‘for those with epigastric pain, abdominal bloating, hypochondriac fullness, and difficulty swallowing, select point Zusanli (ST 36)’. Previous study has showed that needling Zusanli (ST 36) could regulate the factors involved in the injury of gastric mucosa, such as endothelin (ET), calcitonin gene-related peptide (CGRP), epidermal growth factor (EGF) and nitric oxide (NO)^[134]. The combined use of Zusanli (ST 36) and Zhongwan (CV 12) can effectively repair gastric mucosa^[135]. Electroacupuncture at Zhongwan (CV 12) and Weishu (BL 21) can boost gastric movement through regulating motilin and gastrin levels^[136].

Our findings further suggested that main points in CAG treatment originate from the Stomach Meridian of Foot Yangming, Conception Vessel, Bladder Meridian of Foot Taiyang and Spleen Meridian of Foot Taiyin. The food we eat is contained in the stomach under the action of stomach qi. That’s why the stomach is called ‘granary’ and ‘the sea of foodstuff’. When the stomach functions normally in receiving and decomposing the foodstuff, the appetite will be normal. If the stomach’s function in receiving and decomposing the foodstuff gets disordered, a poor appetite or a foul breath may be present. The spleen governs transformation and transportation of water and food. These functions provide the material basis for production of qi and blood, and it is very important to the maintenance of body’s vital activities. Therefore, one should protect the spleen carefully to ensure spleen qi’s function in transformation and transportation, so that qi and blood will be sufficient and the body will be free from invasion of pathogens. All the Back-Shu points are situated on the first lateral line of the Bladder Meridian of Foot Taiyang. Previous studies have shown that stimulating the Back-Shu points could increase the pepsinogen (PG) I and PG II contents in the CAG model rats to protect gastric mucosa^[137].

Specific points are widely used in acupuncture-moxibustion treatment of CAG according to this research, and the Five Shu-Transmitting points were most frequently used, the Eight Influential points ranked second and the Confluent Points of the Eight Extraordinary Meridians ranked the third. He-Sea points were most frequently used in the Five Shu-Transmitting points. It is said in *Ling Shu (Spiritual Pivot)* that ‘He-Sea points can cure diseases of Fu organs’. Zusanli (ST 36) plays an especially important role in regulating gastrointestinal function^[138-141], reflecting that ‘acupuncture points are indicated for symptoms associated with the pathways of the meridian’. Stomach is one of the Fu organs in TCM. Zhongwan (CV 12) is one of the Eight Influential points, and governs Fu organs. It is also the Front-Mu point of the stomach. Following

Zusanli (ST 36), Zhongwan (CV 12) was the second most frequently used special acupoint, reflecting the therapeutic effect of selecting topical points.

The following conclusion can be drawn from the current literature stat of acupuncture-moxibustion for CAG: Zusanli (ST 36), Zhongwan (CV 12), Weishu (BL 21) are most frequently used points; the main points are mainly from the Stomach Meridian of Foot Yangming, Conception Vessel, Bladder Meridian of Foot Taiyang and Spleen Meridian of Foot Taiyin; the main specific points mainly include the Five Shu-Transmitting points, the Eight Influential points, and the Confluent Points of the Eight Extraordinary Meridians. However, there are still some drawbacks in the related studies, such as: most studies did not give treatment based on syndrome differentiation; acupuncture prescriptions are diverse and cannot be unified; most literatures lack the support of evidence.

Via our primary data mining, we have sorted out the main points and combination patterns in acupuncture-moxibustion treatment of CAG. The results can provide ideas for clinical treatment and scientific research. It also shows that through the data mining, abundant connotation of the existing literature can be effectively explored to upgrade the level of diagnosis and treatment.

Conflict of Interest

The authors declared that there was no potential conflict of interest in this article.

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