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Literature Study

Commonality and pattern analysis of acupoint selection in moxibustion treatment of asthma

艾灸治疗哮喘临床选穴共性和规律分析

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Abstract

Objective: To analyze and summarize the commonalities and patterns in acupoint selection for moxibustion treatment of asthma.

Methods: Data retrieval was conducted using 'moxibustion' and 'asthma' as the keywords through China National Knowledge Infrastructure (CNKI), Wanfang Academic Journal Full-text Database (Wanfang) and Chongqing VIP Database (CQVIP). Excel 2010 was used to establish the major acupoint database for moxibustion prescriptions in treatment of asthma; data mining methods including association patterns and clustering were adopted to analyze the characteristics and patterns in acupoint selection for moxibustion treatment of asthma.

Results: A total of 161 moxibustion prescriptions were recruited. The most commonly used acupoint was Feishu (BL 13), the most commonly used meridian was the Bladder Meridian of Foot Taiyang, and the most commonly treated region was the back. The association rule analysis showed that Feishu (BL 13)-Dazhui (GV 14)-Fengmen (BL 12) had the most significant correlation, and the clustering analysis discovered 5 effective acupoint clusters.

Conclusion: In moxibustion treatment of asthma, topical acupoints Feishu (BL 13), Dazhui (GV 14) and Fengmen (BL 12) can be selected, along with the acupoints from the Bladder Meridian of Foot Taiyang and the back.

Keywords: Acupuncture-moxibustion Therapy; Moxibustion Therapy; Asthma; Data Mining; Bibliometrics

【摘要】目的：分析并总结艾灸治疗哮喘的选穴共性和规律。**方法：**以“艾灸”和“哮喘”等为检索词，在中国知网(CNKI)、万方学术期刊全文数据库(Wanfang)和重庆维普数据库(CQVIP)中进行文献检索，用Excel 2010建立艾灸治疗哮喘处方主穴数据库，运用数据挖掘技术中的关联规则和聚类方法，分析艾灸治疗哮喘处方用穴的特点和规律。**结果：**共纳入艾灸处方161条，使用频次最高的穴位、经络和部位分别为肺俞、足太阳膀胱经和背部，关联规则分析显示穴位之间相关性最高的为肺俞-大椎-风门，聚类分析结果显示存在5个有效用穴群组。**结论：**艾灸治疗哮喘时可以局部选用肺俞、大椎和风门三穴，并相应选择足太阳膀胱经穴位和背部局部穴位。

【关键词】针灸疗法；灸法；哮喘；数据挖掘；文献计量学

【中图分类号】R245.8　　**【文献标志码】**A

Bronchial asthma, or asthma for short, is a chronic airway inflammatory disease. It is more likely to attack and aggravate at night and/or in the early morning.Its main symptoms include recurrent wheezing, shortness of breath, chest tightness and coughing[1]. Due to its recurrent attacks, inhaled glucocorticosteroid and rapid-acting β2 receptor agonist are still used in a long term as the first treatment choice, and thus the subsequent adverse reactions are inevitable[2-3]. Moxibustion is an external therapy of traditional Chinese medicine. It is easy-to-operate, cost effective, with few adverse reactions, and has been widely used to treat asthma and achieved significant efficacy[4-8]. However, the acupoint selection commonality and patterns have not been well studied yet in moxibustion treatment of asthma. Therefore, this study was to discuss the commonality and principle in acupoint selection in moxibustion treatment of asthma by collecting and summarizing the relevant clinical reports published in recent years, to provide evidence and reference for clinical application.

1 Data and Methods

1.1 Literature retrieval range and method

'Jiu', 'Aijiu', 'Xiaochuan', 'Xiao' and 'Chuan' were taken as the key terms for computer-based retrieval through

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the China National Knowledge Infrastructure (CNKI), Wanfang Academic Journal Full-text Database (Wanfang) and Chongqing VIP Database (CQVIP) from the inception till December 2017.

1.2 Inclusion criteria

Clinical studies, including randomized controlled trials, semi-randomized controlled trials, observational trials and single case reports; the studies had to provide universally recognized diagnosis criteria and inclusion criteria, the study subjects were all diagnosed with asthma while their gender, age, disease duration and source were not limited; the intervention was moxibustion with moxa as the major material; the acupoints involved in the treatment were all introduced.

1.3 Exclusion criteria

Literatures that were unrelated to the theme; for duplicates or studies published by the same study group on moxibustion treatment of asthma, only the latest published one was included; since warm needling involves both acupuncture and moxibustion, the studies taking warm needling as intervention method were excluded; studies with heat-sensitive moxibustion as the intervention approach were also excluded because it treats the sensitized points instead of traditional acupoints.

1.4 Literature screening

All the retrieved studies were imported into *Reference Aid for Medicine* software. The duplicate publications and the studies indexed repeatedly by the three databases were screened; the studies unrelated to the theme were manually screened out through title and abstract reading; through full-text reading, the studies with ineligible intervention were excluded. The screening process was completed by two authors independently and the results would be compared with each other. Any disagreements were solved by a third author.

1.5 Data standardization

The data were standardized, including authors, name of the journal, acupoints, located region of acupoint, meridian belonging and special acupoints, etc. Acupoint name was unified based on the *Science of Meridians and Acupoints* (Textbook for the 13th Five-year Plan)[9] published by China Press of Traditional Chinese Medicine.

1.6 Statistical analysis

Excel 2010 was used to establish the acupoint prescription database for moxibustion treatment of asthma, which contained the title of the article, authors, acupoints, meridian belonging, acupoint located region and special acupoints. Descriptive and clustering analyses were run by SPSS 20.0 statistical software, with between-group linkage method and square Euclidean distance selected. With SPSS modeler 14.1, association patterns among the selected acupoints were analyzed using Apriori algorithm, majorly by measuring the confidence, support and lift. The support refers to the possibility of concurrence of the former and latter items; confidence indicates the possibility of the occurrence of the latter item given the appearance of the former item; lift >1 suggests an effective positive correlation.

2 Results

2.1 Descriptive analysis

Based on the inclusion and exclusion criteria, a total of 161 studies were finally included, involving 60 acupoints with a total frequency of 757. The top 10 acupoints on the frequency list were Feishu (BL 13), Dazhui (GV 14), Shenshu (BL 23), Fengmen (BL 12), Dingchuan (EX-B 1), Danzhong (CV 17), Pishu (BL 20), Gaohuang (BL 43), Zusanli (ST 36) and Tiantu (CV 22), and their total frequency of use was 571, accounting for 75.4% of the total frequency.

The 60 acupoints were from 10 meridians, including 8 ordinary meridians, the Conception Vessel and the Governor Vessel. According to the frequency of use, they were Bladder Meridian of Foot Taiyang, Conception Vessel, Governor Vessel, Stomach Meridian of Foot Yangming, Lung Meridian of Hand Taiyin, Kidney Meridian of Foot Shaoyin, Triple Energizer Meridian of Hand Shaoyang, Liver Meridian of Foot Jueyin, Large Intestine Meridian of Hand Yangming and Gallbladder Meridian of Foot Shaoyang.

The acupoints with a frequency of over 10 times were majorly located in the back, including Feishu (BL 13), Dazhui (GV 14), Fengmen (BL 12), Dingchuan (EX-B 1), Pishu (BL 20), Gaohuang (BL 43), Geshu (BL 17) and Xinshu (BL 15); then it was the acupoints located in the chest, including Danzhong (CV 17) and Tiantu (CV 22); then it was the lower back, and the acupoint was Shenshu (BL 23) alone; there were also acupoints located in the lower limbs and abdomen. The acupoints with a frequency of over 10 times are shown in Table 1.

2.2 Association pattern analysis

A total of 19 association patterns were obtained when the former item >2, confidence >90%, support >15% and lift >1 (Table 2). The support and confidence reflected the effectiveness of acupoint grouping. For example, in the first association pattern of Fengmen (BL 12)-Feishu (BL 13), Fengmen (BL 12) was the former item and the latter item was Feishu (BL 13), and confidence 100% indicated that the possibility of the occurrence of Feishu (BL 13) was 100% given the appearance of Fengmen (BL 12); 31.875% support meant the concurrence of Fengmen (BL 12) and Feishu (BL 13) happened in 31.875% of the total 161 moxibustion prescriptions; lift=1.176 suggested that this association pattern was a valid positive correlation. Of the 19 effective association patterns, Dazhui (GV 14)-Feishu (BL 13) owned the highest support (51.25%); of

the 7 association patterns with a 100% confidence, Fengmen (BL 12)-Feishu (BL 13) had the highest support (31.875%); among the three-acupoint association patterns, Fengmen (BL 12)-Dazhui (GV 14)-Feishu (BL 13) won the highest support (25.625%), and its confidence was 100.00%.

2.3 Clustering analysis

The SPSS version 20.0 was used for the clustering analysis of the top 16 acupoints with a frequency over 10 times. Divided by 5, 4 valid clusters could be obtained (the other one was invalid): Shenshu (BL 23)-Pishu (BL 20)-Guanyuan (CV 4)-Zusanli (ST 36)-Dingchuan (EX-B 1), Dazhui (GV 14)-Fengmen (BL 12)-Feishu (BL 13), Danzhong (CV 17)-Tiantu (CV 22)-Fenglong (ST 40)-Gaohuang (BL 43)-Qihai (CV 6) and Geshu (BL 17)-Xinshu (BL 15). Divided by 9, still 4 valid clusters were obtained (the other 5 clusters were invalid): Shenshu (BL 23)-Pishu (BL 20)-Guanyuan (CV 4), Dazhui (GV 14)-Fengmen (BL 12)-Feishu (BL 13), Danzhong (CV 17)-Tiantu (CV 22)-Fenglong (ST 40) and Geshu (BL 17)-Xinshu (BL 15). Considering the indications of the acupoints, 5 effective clusters were obtained when divided by 7: Shenshu (BL 23)-Pishu (BL 20)-Guanyuan (CV 4)-Zusanli (ST 36), Dazhui (GV 14)-Fengmen (BL 12)-Feishu (BL 13), Danzhong (CV 17)-Tiantu (CV 22)-Fenglong (ST 40), Gaohuang (BL 43)-Qihai (CV 6), and Geshu (BL 17)-Xinshu (BL 15).

Table 1. Acupoint selection frequency in moxibustion treatment of asthma

Order	Acupoint	Frequency	Ratio (%)
1	Feishu (BL 13)	137	18.1
2	Dazhui (GV 14)	87	11.5
3	Shenshu (BL 23)	56	7.4
4	Fengmen (BL 12)	51	6.7
5	Dingchuan (EX-B 1)	47	6.2
6	Danzhong (CV 17)	44	5.8
7	Pishu (BL 20)	43	5.7
8	Gaohuang (BL 43)	38	5.0
9	Zusanli (ST 36)	34	4.5
10	Tiantu (CV 22)	34	4.5
11	Guanyuan (CV 4)	16	2.1
12	Zhongwan (CV 12)	14	1.8
13	Geshu (BL 17)	14	1.8
14	Xinshu (BL 15)	13	1.7
15	Qihai (CV 6)	13	1.7
16	Fenglong (ST 40)	13	1.7

Table 2. Acupoint association analysis

Order	Former item	Latter item	Support (%)	Confidence (%)	Lift
1	Dazhui (GV 14)	Feishu (BL 13)	51.25	96.47	1.14
2	Shenshu (BL 23)	Feishu (BL 13)	33.75	96.43	1.13
3	Fengmen (BL 12)	Feishu (BL 13)	31.88	100.00	1.18
4	Dingchuan (EX-B 1)	Feishu (BL 13)	28.13	95.75	1.12
5	Fengmen (BL 12)-Dazhui (GV 14)	Feishu (BL 13)	25.63	100.00	1.18
6	Pishu (BL 20)	Feishu (BL 13)	25.00	95.24	1.12
7	Danzhong (CV 17)	Feishu (BL 13)	25.00	90.91	1.07
8	Pishu (BL 20)	Shenshu (BL 23)	24.38	92.86	2.65
9	Gaohuang (BL 43)	Feishu (BL 13)	23.75	100.00	1.18
10	Pishu (BL 20)-Shenshu (BL 23)	Feishu (BL 13)	23.13	94.87	1.12
11	Pishu (BL 20)-Feishu (BL 13)	Shenshu (BL 23)	23.13	92.50	2.64
12	Tiantu (CV 22)	Feishu (BL 13)	19.38	91.18	1.07
13	Zusanli (ST 36)	Feishu (BL 13)	19.38	91.18	1.07
14	Shenshu (BL 23)-Dazhui (GV 14)	Feishu (BL 13)	17.50	100.00	1.18
15	Gaohuang (BL 43)-Dazhui (GV 14)	Feishu (BL 13)	16.88	100.00	1.18
16	Danzhong (CV 17)-Dazhui (GV 14)	Feishu (BL 13)	16.88	96.43	1.13
17	Danzhong (CV 17)-Fengmen (BL 12)	Feishu (BL 13)	16.25	100.00	1.18
18	Dingchuan (EX-B1)-Dazhui (GV 14)	Feishu (BL 13)	15.00	100.00	1.18
19	Dingchuan (EX-B1)-Shenshu (BL 23)	Feishu (BL 13)	15.00	96.00	1.13

3 Discussion

Asthma is a chronic airway inflammatory disorder. It is recurrent and persistent, and often treated to control the symptoms, maintain normal pulmonary ventilation function and reduce acute attacks[10]. Through sorting and analyzing the clinical studies on moxibustion treatment of asthma, we have found that acupoints from the Bladder Meridian of Foot Taiyang, Governor Vessel and Conception Vessel which run through the chest and back were often selected. The association pattern and clustering analyses of the frequently used acupoints showed that they could be divided into 5 effective clusters: Feishu (BL 13)-Dazhui (GV 14)-Fengmen (BL 12), Danzhong (CV 17)-Tiantu (CV 22)-Fenglong (ST 40), Gaohuang (BL 43)-Qihai (CV 6), Shenshu (BL 23)-Pishu (BL 20)-Guanyuan (CV 4)-Zusanli (ST 36), and Geshu (BL 17)-Xinshu (BL 15).

3.1 Feishu (BL 13)-Dazhui (GV 14)-Fengmen (BL 12): reinforcing the lung qi

Asthma is usually incurred when the phlegm dormant in the lung is evocated by invasion of external pathogens, improper diet, emotional stimulation, weakness and fatigue. These factors may cause the blockage of airway and dysfunction of the lung in dispersing and descending. The lung is mainly affected[11]. Feishu (BL 13), Dazhui (GV 14) and Fengmen (BL 12) are all located on the back. According to the theory that the acupoint can be used to treat disorders of where it is located, these three acupoints are adopted to treat asthma. Moreover, Feishu (BL 13) is the Back-Shu point of the lung. The disorder of Zang organs should be treated by their Back-Shu points. Therefore, Feishu (BL 13) not only can reinforce lung qi, but also regulate and unblock the waterway, and cease cough and wheezing. Dazhui (GV 14) is the crossing point of the three yang meridians and the Governor Vessel, and considered as the joint point of yang energy. Thus, it can be used to reinforce yang qi and stop coughing and wheezing[12]. The Foot Taiyang governs the surface of the body. The wind is predominant among the six external pathogens. Fengmen (BL 12) gets its name because it is where the external pathogens start to attack Foot Taiyang, and that is why it can be used to fortify the external to defend against the external pathogens[13]. Our study results revealed that Feishu (BL 13), Dazhui (GV 14) and Fengmen (BL 12) ranked No. 1, 2, and 4, respectively, in acupoint selection frequency list for moxibustion treatment of asthma. The association pattern analysis also showed that in the 19 effective association patterns, Feishu (BL 13)-Dazhui (GV 14) had the highest support (51.25%). Of the 7 association patterns which had a confidence of 100%, Feishu (BL 13)-Fengmen (BL 12) had the highest support (31.875%). Fengmen (BL 12)-Dazhui (GV 14)-Feishu (BL 13) also won the highest support among the 3-acupoint association patterns and its confidence was 100%. Therefore, Fengmen (BL 12)-Dazhui (GV 14)- Feishu (BL 13) can be used as an acupoint group in moxibustion treatment of asthma for reinforcing the lung qi.

3.2 Danzhong (CV 17)-Tiantu (CV 22)-Fenglong (ST 40): relaxing the chest, regulating qi and resolving phlegm

Dan Xi Xin Fa · Chuan Lun (*Asthma Chapter of Danxi's Mastery of Medicine*) states that phlegm is the crucial factor in asthma. When phlegm lurks in the lung, the person will develop chest tightness and wheezing. Danzhong (CV 17) is located in between the breasts and is one of the Eight Confluent points, specifically standing for qi. This acupoint can relax the chest and regulate qi. It can be used to release symptoms such as chest tightness. Tiantu (CV 22) is located at the suprasternal fossa beyond the lung. It works to bring down the reverse qi flow to cease belching. Stimulating Tiantu (CV 22) during the attack of asthma can reduce the resistance in airway, so as to release asthma. In the remission stage, this acupoint can also be used to improve the lung function and achieve satisfactory long-term efficacy[14]. As the Luo-Connecting point of the Stomach Meridian of Foot Yangming, Fenglong (ST 40) connects the spleen, concurrently regulating both the Spleen and Stomach Meridians. It is a significant point regulating the function of the spleen and stomach in transporting and transforming the fluid and dampness. *Yu Long Ge* (*Yu Long Verses*) records that reducing manipulations at Fenglong (ST 40) can be used to treat excessive phlegm, suggesting that this point is crucial for dispelling phlegm and dampness[13]. Danzhong (CV 17) and Tiantu (CV 22) together can release chest tightness and shortness of breath caused by phlegm; Fenglong (ST 40) can clear phlegm, the cause of chest tightness and shortness of breath[15-17]. Hence, when using moxibustion to treat asthma, the acupoint group, Danzhong (CV 17)-Tiantu (CV 22)-Fenglong (ST 40), is suggested to use for relaxing the chest, regulating qi and resolving phlegm.

3.3 Gaohuang (BL 43)-Qihai (CV 6), Shenshu (BL 23)-Pishu (BL 20)-Guanyuan (CV 4)-Zusanli (ST 36): reinforcing the lung, spleen and kidney

Although asthma mainly affects the lung, it is closely related to the spleen and kidney. *Yi Zong Bi Du · Tan Yin* (*Phlegm Chapter of Required Readings for Medical Professionals*) says that the spleen is the source of phlegm and the lung is the container of phlegm. The dormant phlegm in the lung is often due to the poor function of the spleen in transforming water and food into nutrients to nourish the lung, but produce phlegm instead which later lurks inside the lung. The lung is in charge of respiration and the kidney governs receiving the lung qi; the lung is the origin of qi while the kidney is the root. It is often the kidney to blame in the development of asthma for its failure in receiving qi.

Moreover, asthma is a recurrent and persistent problem. If it lasts for a long time, the cold phlegm may hurt the spleen and kidney yang, while the hot phlegm may damage the lung and kidney yin. Therefore, the lung, spleen and kidney should be considered simultaneously in the treatment of asthma. Gaohuang (BL 43) is a key point for tonifying the deficiency, especially for lung deficiency[18]; Qihai (CV 6) supplements qi and yang, so it can help with the deficiency of the lung, spleen and kidney in long-term asthma. The concurrent use of Gaohuang (BL 43) and Qihai (CV 6) can strengthen the function of Feishu (BL 13) in tonifying the lung qi[19-22]. The kidney is the prenatal foundation and the spleen is the postnatal foundation. Shenshu (BL 23) and Pishu (BL 20) are where these two organs pour their Zang-organ qi into the body surface. Guanyuan (CV 4) and Zusanli (ST 36) are commonly used for health promotion in clinic. Moxibustion at these two acupoints can fortify the postnatal foundation and improve the immune system. The above four acupoints can be used together to reinforce the spleen and kidney, fortifying both the prenatal and postnatal foundations[23-28]. Therefore, for moxibustion treatment of asthma, Gaohuang (BL 43) and Qihai (CV 6) can be used to assist Feishu (BL 13) to tonify the lung qi, and Shenshu (BL 23), Pishu (BL 20), Guanyuan (CV 4) and Zusanli (ST 36) for supplementing the spleen and kidney.

3.4 Geshu (BL 17)-Xinshu (BL 15): activating blood circulation to resolve stasis and unblock collaterals

It says in *Xue Zheng Lun* (*Treatise on Blood Syndromes*) that when blood stasis affects the lung, there will be cough and shortness of breath, and blood stasis may cause blockage in the airway, inducing asthma due to dysfunction of the lung in dispersing and descending. The records have pointed out the development of asthma is not only associated with the dormant phlegm in the lung, but also is linked to the blockage in the lung due to blood stasis. It stresses that the joint influences of blood stasis and phlegm should be the root cause of the recurrence of asthma[8]. Lung histopathological study also found effusion, congestion and inflammatory swelling in pulmonary capillaries[29-31]. Thus, the treatment of asthma should not only resolve the phlegm, but also activate blood circulation to dispel stasis and unblock collaterals. Geshu (BL 17) is one of the Eight Confluent points, especially for blood. It is commonly used to treat blood syndromes for its function of promoting blood circulation and resolving stasis. The heart is in charge of blood vessels. The Heart Meridian of Hand Shaoyin goes up from the heart system and connects with the lung. Xinshu (BL 15) is where the heart pours its visceral qi into the body surface. This acupoint can be used to treat blood stasis blocking the collaterals in asthma. In a word, when using moxibustion to treat asthma, Geshu (BL 17) and Xinshu (BL 15) can be adopted to activate blood circulation for unblocking stasis and collaterals[32-36].

In summary, for treatment of asthma with moxibustion, topical points Feishu (BL 13)-Dazhui (GV 14)-Fengmen (BL 12) are suggested to select and other acupoints can be added accordingly, e.g. Danzhong (CV 17)-Tiantu (CV 22)-Fenglong (ST 40) for relaxing the chest, regulating qi and resolving phlegm; Gaohuang (BL 43)-Qihai (CV 6) for assisting Feishu (BL 13) to tonify lung qi; Shenshu (BL 23)-Pishu (BL 20)-Guanyuan (CV 4)-Zusanli (ST 36) for reinforcing the spleen and kidney; Geshu (BL 17)-Xinshu (BL 15) for activating blood circulation to unblock stasis and collaterals.

Conflict of Interest

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

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