

# Exploring the Rule of Selecting Acupoints for Acupuncture Treatment of Knee Osteoarthritis based on Literature Collection and Analysis

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**Keywords:** Acupuncture, Knee Osteoarthritis (KOA), Acupoints, Meridian Classification, Literature Collection, Literature Study.

**Abstract:** Use computer search methods to search literature, which meets the inclusion criteria, on Randomized Controlled Clinical Trial (RCT) about Acupuncture Treatment for Knee Osteoarthritis (KOA) from the relevant databases of China National Knowledge Infrastructure (CNKI), Weipa Journal Full-text Database (VIP), Wanfang Data Knowledge Service Platform, PubMed, etc. The date was from January 2005 to January 2020. Import the retrieved and downloaded documents into NoteExpress2 for management, and analyze the selected 569 documents that meet the requirements of acupuncture treatment of KOA, so as to explore the rule of selecting acupoints for clinical acupuncture treatment of KOA based on literature analysis, in order to provide reference and theoretical guidance for optimizing clinical treatment. The selected acupoints to treat KOA with acupuncture are mainly located at and around the knee joint, and are mainly distributed in the Three Yang Meridians of Foot, the Spleen Meridian of Foot-Taiyin, and the acupoints outside the meridian (Extra Acupoints). The top 10 acupoints with appearance frequency are mainly distributed in the Spleen Meridian of Foot-Taiyin (SP) (3), Extra Acupoints (EX) (3), Stomach Meridian of Foot-Yangming (ST) (2), Gallbladder Meridian of Foot-Shaoyang (GB) (2), etc. The most frequently used acupoints (the top 10 high-selected acupoints) are: "DuBi (ST35)" (544), "Neixiyan (EX-LE4)" (533), "Xuehai (SP10)" (414), "Yanglingquan (GB34)" (392), "Liangqiu (ST34)" (339), "Zusanli (ST36)" (318), "Yinlingquan (SP9)" (285), "Heding (EX-LE2)" (204), "Xiyangguan (GB33)" (84), "Sanyinjiao (SP6)" (63). So, the selection of acupoints for the treatment of KOA with acupuncture, is mainly based on the spleen meridian, stomach meridian, gallbladder meridian, and Extra Acupoints (EX). The characteristics of acupoints selection are selecting local acupoints at and around the knee joint, meanwhile, pays attention to the selection of specific acupoints, of which Wushuxue and Xiahexue are the main points, and Yuanxue, Xixue, and Bahuixue are supplemented. When conduct treatment, the principles of syndrome differentiation, and combining "selecting acupoints of the corresponding meridian" with "selecting local acupoints" should be followed.

## 1 INTRODUCTION

Knee Osteoarthritis (KOA), also known as knee hyperplastic arthritis, is a disease based on degenerative pathological changes. This disease is mainly characterized by primary or secondary degeneration and structural disorder of knee articular cartilage, accompanied by subchondral bone hyperplasia and sclerosis, cartilage exfoliation, and

synovial aseptic inflammation (Liu 2013). The main manifestation is knee pain, which is aggravated after activities, especially when going downhill or downstairs, but the symptoms can be relieved after rest (Fan 2013). This disease belongs to the category of " Arthralgia Syndrome, Flaccidity Syndrome, Bone Impediment, etc. " in Chinese medicine. It has the characteristics of high morbidity, easy recurrence, and lingering course in clinical practice. While causing physical and mental pain and economic loss to patients, it also has an increasingly

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important impact on the public health and medical care system and affects the development of society.

Conservative treatment is mainly used in the early and middle stages of the disease. On the basis of symptomatic treatment, the main purpose is to relieve pain, improve joint stiffness, prevent further damage to cartilage and synovium, and improve joint function, thereby improving the quality of life of patients. Severe joint deformities, difficulty walking, and severe pain are usually treated with surgery in the late stage. Previous literature reports and patients' clinical experience have shown that acupuncture treatment of KOA has the advantages of promoting qi, blood, activating blood, reducing swelling, dredging the meridians and collaterals to relieve pain, reducing the frequency of attacks, long-lasting acupuncture effects, and no obvious side effects (Tian 2019). On this basis, this study analyzes and studies the literature on clinical studies of acupuncture treatment of knee osteoarthritis published in the past 15 years, and explores the rule of selection of acupoints for the treatment of knee osteoarthritis, and provides a reference for optimizing clinical treatment and theoretical guidance.

## 2 MATERIALS AND METHODS

### 2.1 Search Strategy

The relevant subject words used for retrieval are determined by consulting "Medical Subject Headings" (MeSH) and "Chinese Medical Subject Headings" (CMeSH). According to the method of computer search, we will use the set search terms to search the articles and literature which belong to the randomized controlled clinical trials (RCT) of acupuncture and moxibustion treatment of Knee Osteoarthritis published from January 2005 to January 2020 in the relevant database. The databases are China National Knowledge Infrastructure (CNKI), Weipu Journal Full-text Database (VIP), Wanfang Data Knowledge Service Platform, PubMed, etc.

### 2.2 Search Terms

Main search terms:

English search terms: "Knee Osteoarthritis", "KOA", "Acupuncture", "Acupuncture and Moxibustion", "Electro-acupuncture", "Acupuncture therapy", "Acupuncture treatment", etc.

Chinese search terms: 膝骨关节炎, 膝骨性关节炎, 膝关节骨性关节炎, 退行性膝关节炎, 增生性膝关节炎, 膝痹, 针刺, 针灸, 电针, 针灸治疗, 针灸疗法, etc.

Use subject, title or keywords to search, and use conjunctions such as "AND" and "OR" to construct a logical search formula. The search terms of the treatment methods and the search terms of the disease names are connected with "OR"; the search terms of the treatment methods are connected with "AND", so are the disease names.

### 2.3 Literature Inclusion Criteria

① The research object of the literature must be clearly diagnosed as knee osteoarthritis, and have clear diagnostic criteria and efficacy evaluation criteria, and these standards are international or domestic diagnosis and treatment guidelines and industry-recognized standards. ② The original literature must be a randomized controlled trial study. ③ There must be clear and standard names of treatment acupoints. ④ Intervention measures are based on acupuncture, electroacupuncture, etc. as the main treatment methods, used alone or in conjunction with other non-surgical therapies.

### 2.4 Literature Exclusion Criteria

① Does not meet the above inclusion criteria. ② Uncontrolled clinical case studies with animals, cells, etc. as the research object, or the research object cannot be defined according to the content of the literature. ③ The interference of drugs on the research cannot be ruled out. ④ The studies without controls, such as case observations, reviews, case reports, expert experiences, comments, and self-reports of physicians' experiences. ⑤ Self-developed KOA diagnosis and efficacy evaluation criteria, rather than selecting recognized or general standards of literature. ⑥ Sample size in the research was too small ( $n \leq 10$ ). ⑦ Repetitive publication: keep the most recently published, and exclude the rest; the staging reports of different periods in the same long-term clinical study, keep the final published literature (research has been completed) or recently published literature (research is not completed), and the rest are excluded. ⑧ Specific treatment methods, names of acupoints, records or documents with inaccurate descriptions.

## 2.5 Data Extraction and Literature Quality Evaluation

Import the retrieved literature into NoteExpress2. Two researchers respectively read the titles and abstracts of the retrieved literature, screened according to the inclusion and exclusion criteria, carefully read the full text of the literature that may be included, and clarified their conformity; cross-checked the selected literature, Discuss the dispute or invite a third party to make a ruling. Finally, literature that meets the standards will be included. Extract acupoint prescriptions and the meridians they belong to and other information in the literature. As the acupoint A'shi has strong subjectivity and uncertainty, so it is excluded from the statistics. With reference to "Acupuncture and Moxibustion" New Century 3rd Edition (Wang 2012), the aliases and meridians of acupoints are standardized. For example, the unified standard of "Wai Xi Yan", "Du Bi" and "Outer Knee Eye" is "Du Bi" (ST35); "Nei Xi Yan", "Knee Eye" and "Inner Knee Eye" are unified as "Inner Knee Eye" (EX-LE4); the unified standard of "Jue Gu", "Xuan Zhong", "Extreme Bone", and "Hanging Bell" is "Xuan Zhong" (GB39).

After completing the data extraction, use the Microsoft Office 2019 Excel software to design a data extraction table. Enter the names and locations of acupoints used in the literature, and the meridians which belong to, into the table in turn, and count the total frequency of use of all acupoints in the literature.

## 2.6 Statistical Analysis

We used incidence, frequency, percentage, and other indicators to statistically describe and analyze the characteristics of the meridian and distribution of the related acupoints in the included literature via Excel and SPSS 17.0 software. And focused on analyzing the characteristics of the top 10 high-selected acupoints.

## 3 RESULTS

### 3.1 Results of Literature Search

According to the set and unified search strategy, the literature about acupuncture treatment of KOA that had been published in the past 15 years was searched, a total of 3574 articles were roughly

retrieved. According to the inclusion and exclusion criteria which were set, and the repetitive documents in the database were merged, 569 valid documents that met the requirements were finally screened out, including 541 Chinese documents and 28 foreign documents.

## 3.2 Descriptive Analysis

### 3.2.1 Incidence and Frequency Analysis of Acupoints with Acupuncture Treating KOA (see Table 1)

The acupoints appearing in the acupuncture prescriptions in the 569 literature that fit this research are summarized and sorted out, while A'shi points and customized acupoints are excluded. And then arranged the acupoints in descending order of appearance frequency. The top 10 high-selected acupoints are: "DuBi (ST35)" (544), "Neixiyan (EX-LE4)" (533), "Xuehai (SP10)" (414), "Yanglingquan (GB34)" (392), "Liangqiu (ST34)" (339), "Zusanli (ST36)" (318), "Yinlingquan (SP9)" (285), "Heding (EX-LE2)" (204), "Xiyangguan (GB33)" (84), "Sanyinjiao (SP6)" (63).

Appearance frequency of acupoints = [Appearance Incidence of acupoints ÷ total number of prescriptions] × 100%

Table 1 The Incidence and Frequency of Top 10 High-Selected acupoints.

Ranking	Acupoint	Incidence	Frequency (%)
1	Du Bi (ST35)	544	95.60
2	Neixiyan (EX-LE4)	533	93.67
3	Xuehai (SP10)	414	72.76
4	Yanglingquan (GB34)	392	68.89
5	Liangqiu (ST34)	339	59.58
6	Zusanli (ST36)	318	55.89
7	Yinlingquan (SP9)	285	50.09
8	Heding (EX-LE2)	204	35.85
9	Xiyangguan (GB33)	84	14.76
10	Sanyinjiao (SP6)	63	11.07

**3.2.2 Classification and Analysis of Acupoints to the Meridians in the Treatment of KOA by Acupuncture (see Table 2).**

When acupuncture treatment of KOA, the selected acupoints are mainly distributed in the Three Yang Meridians of Foot, the Spleen Meridian of Foot-Taiyin, and the acupoints outside the meridian (Extra Acupoints). The top 10 acupoints with appearance frequency are mainly distributed in the Spleen Meridian of Foot-Taiyin (SP) (3), Extra Acupoints (EX) (3), Stomach Meridian of Foot-Yangming (ST) (2), Gallbladder Meridian of Foot-Shaoyang (GB) (2), etc. (See Table 2). It embodies the principle of "the meridian goes through, and the main treatment is reached" in the acupuncture and moxibustion theory.

Proportion of acupoints = [Number of selected acupoints in the meridian ÷ 10\*] × 100% (\*: the number of selected acupuncture points in the top ten).

Table 2 The meridians where the top 10 high-selected acupoints belonging to and their classification.

Meridian	Acupoints	Number	Proportion of acupoints (%)
Spleen Meridian of Foot-Taiyin (SP)	Xuehai (SP10), Yinlingquan (SP9), Sanyinjiao (SP6)	3	30
Extra Acupoints (EX)	DuBi (ST35), Neixiyan (EX-LE4), Hedong (EX-LE2)	3	30
Stomach Meridian of Foot-Yangming (ST)	Liangqiu (ST34), Zusanli (ST36)	2	20
Gallbladder Meridian of Foot-Shaoyang (GB)	Yanglingquan (GB34), Xiyangguan (GB33)	2	20

**3.2.3 Analysis on the Distribution Characteristics of Acupoints in the Treatment of KOA with Acupuncture (see Table 3).**

Classified according to the location of the top 10 high-selected acupoints, the acupoints commonly

used in clinical practice are mainly concentrated around the knee joint (90%). The main acupoints are the "DuBi (ST35)", "Neixiyan (EX-LE4)", Xuehai (SP10)", "Yanglingquan (GB34)", "Liangqiu (ST34)", "Zusanli (ST36)" and so on. It embodies the principle of "where the acupoints are and where the main treatment is".

Proportion of acupoints = [Number of acupoints in the meridian ÷ 10\*] × 100% (\*: The total number of acupoints in the top 10 high-selected is 10.).

Table 3 Analysis on the distribution characteristics of acupoints in the treatment of KOA with acupuncture.

Location of Acupoints	Acupoints	Number	Proportion of acupoints (%)
Around the knee joint	Xiyangguan (GB33), Yanglingquan (GB34), Xuehai (SP10), Hedong (EX-LE2), DuBi (ST35), Neixiyan (EX-LE4), Yinlingquan (SP9), Liangqiu (ST34), Zusanli (ST36)	9	90
Lower extremities (except the acupoints around the knee joint)	Sanyinjiao (SP6)	1	10

**3.2.4 Analysis of the Characteristics of the Top 10 High-Selected Acupoints in the Treatment of KOA with Acupuncture (see Table 4).**

Analyzing the characteristics and properties of the top 10 high-selected acupoints, it can be seen that acupoints in common meridians are mainly distributed around the knee joint and play a role in local treatment; the proportion of specific acupoints is also relatively high, especially the Wushu acupoints (Wushuxue), He acupoints (Hexue). Wushu acupoints (Wushuxue) are the parts where the meridian Qi starts, runs, and converges in the viscera. Stimulating Wushu acupoints can dredge the meridians, reconcile and harmony the Qi and blood. He acupoints (Hexue) are distributed around the elbow and knee joints, the Qi and blood flow into the He acupoint and then merge deeply into the

viscera. Stimulating He acupoints can regulate and harmony Qi and blood.

Table 4 Analysis of the characteristics of the top 10 high-selected acupoints in the treatment of KOA with acupuncture.

Category	Characteristics of acupoints	Acupoints	Number	Proportion of acupoints (%)
Acupoints in common meridians		Xiyangguan (GB33), Xuehai (SP10), Hedong (EX-LE2), DuBi (ST35), Neixiyan (EX-LE4)	5	50
Specific acupoints	Wushuxue	Yanglingquan (GB34), Yinlingquan (SP9), Zusanli (ST36)	3	30
	Hexue	Yanglingquan (GB34), Zusanli (ST36)	2	20
	Xixue	Liangqiu (ST34)	1	10
	Bahuixue	Yanglingquan (GB34)	1	10
	Jiaohuixue	Sanyinjiao (SP6)	1	10

## 4 DISCUSSIONS

Knee osteoarthritis (KOA) is a common disease in middle-aged and elderly people. The main pathological change of KOA is degeneration of articular cartilage, involving bone, synovium, joint capsule and other joint structures, accompanied by cartilage destruction and osteophyte formation. The main clinical manifestations of this disease are pain, swelling, stiffness, and dysfunction of knee joint (Chen 2019). This disease belongs to the category of "Arthralgia Syndrome, Flaccidity Syndrome, Bone Impediment, etc." in Traditional Chinese Medicine. The theoretical system of TCM has a unique understanding of the etiology, pathogenesis, and syndrome differentiation of this disease. The nature of the disease is exterior excess and interior deficiency. The pathogenesis of which is the external seems excessive, and the internal is the deficiency syndrome, which is mainly represented by stagnation of tendons and muscles, deficiency of liver and kidney, insufficiency of qi and blood, lack of nourishment for tendons and bones, marked by the inclusion of wind, cold, damp and pathogenic factors and the internal production of phlegm and

blood stasis (Yu 2015). Acupuncture therapy has the functions of adjusting Yin and Yang, harmonizing Qi and blood, dispersing meridians and dredging collaterals, reducing swelling and relieving pain. Selecting local acupoints can dredge the meridians, regulate qi and blood, relieve or eliminate "Pain caused by obstruction and stagnation of Qi and blood", thereby reducing symptoms like pain, stiffness, swelling and so on.

It can be seen from this study that the acupoints selected for the treatment of the disease are mainly located around the knee joint. The meridians belong to are mainly distributed in the three Yang meridians of foot, the Spleen Meridian of Foot-Taiyin (SP) and Extra Acupoints (EX), among which the top 10 acupoints with frequency are mainly distributed in the Spleen Meridian of Foot-Taiyin (SP) (3), Extra Acupoints (EX) (3), Stomach Meridian of Foot-Yangming (ST) (2), Gallbladder Meridian of Foot-Shaoyang (GB) (2), etc. The most frequently used acupoints are "DuBi (ST35)", "Neixiyan (EX-LE4)", "Xuehai (SP10)", "Yanglingquan (GB34)", "Liangqiu (ST34)", "Zusanli (ST36)", "Yinlingquan (SP9)", "Hedong (EX-LE2)", "Xiyangguan (GB33)", "Sanyinjiao (SP6)". Local acupoints selection of the knee joint reflects the principle of acupuncture and moxibustion: "where the acupoints are, the main treatment reaches". Acupuncture on the acupoints around the knee joint can not only achieve the original effect of acupuncture, but also play a role in relieving adhesion, so as to improve the symptoms such as stiffness of the knee joint.

Analysis of the top 10 high-selected acupoints: "DuBi (ST35)", is mainly used to treat knee joint pain, numbness, and difficulty in squatting and standing up flexibly. Acupuncture or moxibustion "DuBi (ST35)" and "Neixiyan (EX-LE4)" can dredge the meridians and smooth the joints, thereby reducing knee joint pain and improving knee joint mobility. "Hedong (EX-LE2)" can relax and smooth the tendons, dredge the meridians and activate the collaterals, mainly used for the treatment of knee joint pain. "Xuehai (SP10)" means where the blood gathering, via acupuncture and moxibustion can remove blood stasis and dredge the meridian, by regulating the release of vasoactive factors, changing the shape of capillaries, accelerating the blood flow rate, and changing the hypercoagulable state of the blood (Zhao, 2004). In the theory of Traditional Chinese Medicine, the spleen controls the limbs, hands and feet, and "Yinlingquan (SP9)" is the He acupoints (Hexue) of the spleen meridian, so stimulate this point can treat diseases of the limbs, such as knee joint pain and paralysis of the lower

limbs. The three yin meridians of the kidney, liver, and spleen converge in "Sanyinjiao (SP6)", so stimulating this acupoint can strengthen the spleen, nourish the liver, benefit the kidney, and strengthen tendons and bones (Jin 2017). It has a good treatment effect on the arthralgia of Qi deficiency and blood stasis type (Huang 2011). "Liangqiu (ST34)", as the Xi acupoint (Xixue) of the Stomach Meridian of Foot-Yangming (ST), is mainly used to treat diseases of the waist and knee joints, such as pain, clod and numbness of lower limbs, knees, feet and waist; joints difficulty in squatting, flexion and extension (Zou 2021). "Zusanli (ST36)", is the He acupoint (Hexue) of the Stomach meridian. Warming acupuncture at this point can improve local circulation, promote the absorption of inflammatory mediators, and reduce the inflammatory response of knee osteoarthritis (Guan 2020). Acupuncture at "Liangqiu (ST34)", and Zusanli (ST36) can tonify the spleen, nourish Qi and blood, regulate the movement of Qi, relieving spasm and pain, invigorating spleen to eliminate dampness, and can destroy the wind with promoting blood circulation, nourish muscles and veins, rejuvenate and strong the tendons, and lubricate joints (Tian 2013). "Yanglingquan (GB34)" is the place where the Qi of Gallbladder Meridian of Foot-Shaoyang (GB) gathers and confluent, and it also is the Xiahexue (lower confluent point) of the gallbladder. Moxibustion in Yanglingquan can improve the flexion and extension of the knee joint (Wang 2020). The tendons gather in "Yanglingquan (GB34)". Therefore, this acupoint is often selected for the treatment of knee osteoarthritis. "Xiyangguan (GB33)", located in the Gallbladder Meridian of Foot-Shaoyang (GB), can promote the flow of Qi and blood of knee joint, mainly used to treat knee joint swelling and pain, lower leg muscle spasm, calf numbness, knee arthritis, lower limb paralysis, etc. (Wu 2020)

## 5 CONCLUSIONS

In summary, when selecting acupoints to conduct treatment of knee osteoarthritis with acupuncture, the principles of syndrome differentiation, and combining "selecting acupoints of the corresponding meridian" with "selecting local acupoints" should be followed. The selection of acupoints for treatment of KOA with acupuncture, is mainly based on the spleen meridian, stomach meridian, gallbladder meridian, and Extra Acupoints (EX). Select local acupoints at and around the knee joint, and local

stimulation is the main method of treatment; At the same time, it pays attention to the selection of specific acupoints, of which Wushuxue and Xiahexue are the main points, and Yuanxue, Xixue, and Bahuixue are supplemented. This is consistent with our actual clinical operation, so patients can have a higher degree of recognition and compliance based on the curative effect, which also provides a certain scientific basis for the selection of therapeutic acupoints in the clinic. Reviewing this study, there are also problems such as the quality of the included literature is not enough uniform, and the various syndrome types involved are not further refined. These may have an impact on the analysis results. In future research, measures should be taken to avoid these influencing factors, so as to obtain a better evidence-based basis and provide reference basis and theoretical guidance for optimizing clinical treatment.

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