

# Exploring the point selection pattern of acupuncture for the treatment of postoperative pain after hip arthroplasty based on data mining

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**Abstract:** Objective: To use data mining to explore the pattern of acupuncture points for the treatment of postoperative pain after hip arthroplasty. Methods: The search retrieved the literature about acupuncture treatment for postoperative pain after hip replacement from May 1, 2019-May 1, 2025 from China Knowledge and Wanfang databases, and extracted the data of authors, article names, sources, publication years, treatments, and acupoint prescriptions in the literature to analyze the acupuncture treatment for its acupoint prescriptions, including frequency of point selection, acupoint attribution, specific point selection, association rules, and systematic clustering. Results: A total of 22 papers were included in this paper, and a total of 32 acupoints appeared in the papers, containing 8 specific acupoints, a total of 9 meridians, and also containing 3 empirical acupoints. Using Apriori algorithm to analyze the association rules of the selected acupoints in 22 papers, the top 5 combinations in order of support were “Liangqiu-Blood Sea-Taichong”, “Foot Sanli-Blood Sea-Taichong”, “Blood Sea-Liangqiu- footsanli”, “taichong - Liangqiu - footsanli”, “footsanli - blood sea - taichong - Liangqiu”. Acupuncture points for the treatment of postoperative pain after hip arthroplasty can be broadly categorized into 5 categories. Conclusion: Acupuncture points for the treatment of postoperative pain after hip arthroplasty were mainly selected from the acupoints of Foot Sanli, Blood Sea, and Taichong; specific acupoints were mainly lost, original, and combined; acupoints were mainly attributed to the Foot Yangming Stomach Meridian, the Foot Shaoyang Gallbladder Meridian, and the Foot Taiyin Spleen Meridian; and the core acupoints were combined as “Foot Sanli-Blood Sea,” “Taichong-Liangqiu,” “Foot Sanli-Blood Sea-Tai Chong-Liangqiu,” “Foot Sanli-Tai Chong-Tai Chong-Liangqiu”. Liangqiu”.

**Keywords:** Post-operative pain after hip arthroplasty; Acupuncture and moxibustion; Acupuncture point pattern; Data mining; Visualization

Total hip replacement (THA) refers to the use of artificial polymer materials to replace the hip joint that has lost its normal function, so as to achieve the purpose of rebuilding the function of the hip joint, the procedure is designed to relieve the pain and improve the function of patients with advanced hip arthritis, and it is an effective way of clinical treatment of end-stage hip diseases<sup>[1]</sup>. Clinical artificial hip replacement surgery often occurs after the affected limb swelling, pain and other symptoms, affecting the wound healing in the surgical area, the main reason is that the surgery stimulates the local microcirculation, causing hemodynamic changes, microcirculation disorders, at the same time, in the process of replacement surgery, due to a series of operations such as peeling of the soft tissues, the external rotator muscle group loosening, grinding of the acetabulum, expanding the medulla, etc., which exacerbates the release of inflammatory factors, causing inflammatory reaction in the organism, all of which can cause the manifestation of limb swelling and pain<sup>[2]</sup>. Postoperative pain not only causes delayed early recovery, increased length of hospitalization, and higher complication rates, but also seriously affects the quality of life of patients<sup>[3]</sup>. Therefore, pain management after THA is particularly important. Currently, most common analgesic measures are multimodal analgesia, including opioid-based self-controlled analgesia, peripheral nerve block, intrathecal morphine and epidural analgesia, etc., and most of them have adverse reactions such as respiratory depression, nausea, vomiting, and urinary retention<sup>[4]</sup>. And with the continuous development of traditional Chinese medicine, the analgesia of auricular acupuncture, acupuncture and traditional Chinese medicine is gradually increasing, which has the advantages of fewer adverse reactions, simple operation and easy acceptance by patients, and the two complement each other to achieve the reduction of drug dosage, reduce the incidence of postoperative adverse reactions and complications, improve the effectiveness and safety, and accelerate the recovery process. In this study, by using the analysis method of data mining, we summarize and summarize the rules of acupuncture point selection of medical doctors and scholars in the treatment of pain after THA, so as to provide clinical researchers with the theoretical basis and reference basis for clinical diagnosis and treatment of Chinese medicine and acupuncture.

## Information and Methods

### Literature sources

Relevant literature on acupuncture for postoperative pain after hip arthroplasty from May 1, 2019 to May 1, 2025 were selected from China national knowledge infrastructure (CNKI) database and Wanfang Database.

### Literature search strategy

Literature database search was conducted with “post hip replacement pain” AND “acupuncture + acupuncture + acupuncture therapy + acupuncture therapy

+ millipore” as the subject terms for advanced search, published on 2019-05-01 to 2025-05-01.

## Literature Inclusion Criteria

Clinical trial-type literature published from May 1, 2019 to May 1, 2025 on acupuncture treatment of postoperative pain after hip arthroplasty, with patients with postoperative pain after hip arthroplasty as the main research object, as well as clear prescriptions for acupoints, with treatments mainly focusing on acupuncture and needle puncture, with clear therapeutic methods and observational indexes, and with a number of cases of no fewer than 20 people.

## Literature Screening and Data Processing

The researchers screened the literature related to acupuncture treatment of postoperative pain after hip arthroplasty according to the inclusion and exclusion criteria, extracted the raw data of the literature such as author, article name, source, year of publication, treatment method, and acupuncture point prescription, and entered them into Excel for data summarization and organization, and used SPSS Modeler 18.0, SPSS 25.0, SPSS Modeler 18.0, SPSS 25.0, Origin and other software were used to analyze and process the raw data.

## Results

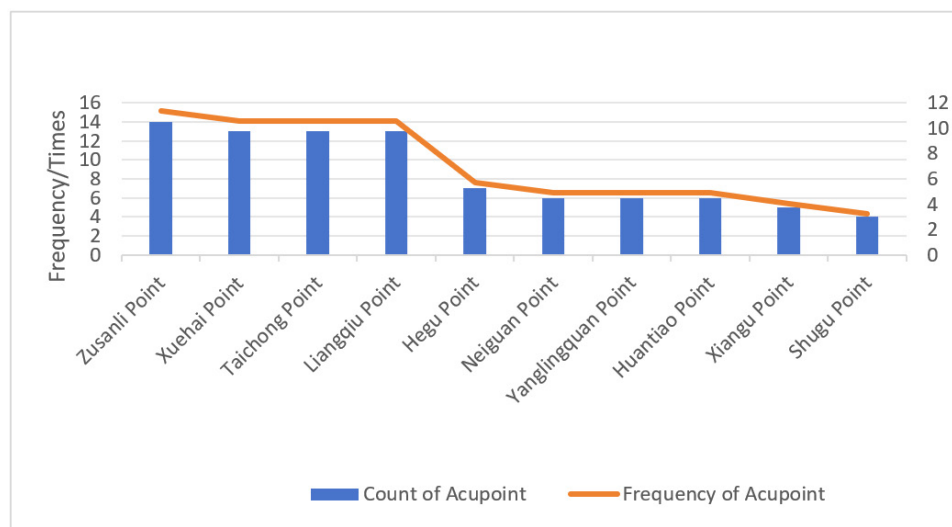
Frequency analysis of acupuncture points selected for the treatment of postoperative pain after hip arthroplasty

According to the analysis of related literature, a total of 32 acupuncture points were involved, with a total frequency of 123 times, among which the top ten points taken in order of frequency were: foot Sanli (11.38%), Sea of Blood (10.57%), Tai Chong (10.57%), Liang Qiu (10.57%), Hegu (5.69%), Neiguan (4.88%), Yinlingquan (4.88%), Huanjiao (4.88%), Sunken Bone (4.07%), and Shuangjiao (3.25%). The top 10 acupoints in terms of frequency of use are shown in Table 1 and **Figure 1**.

**Table 1.** Table of high-frequency acupoints for acupuncture treatment of postoperative pain after hip arthroplasty (Frequency words Top10).

| No. | Acupuncture point | Frequency (times) | No. | Herbal medicine     | Frequency (times) |
|-----|-------------------|-------------------|-----|---------------------|-------------------|
| 1   | Zusanli (ST36)    | 14                | 6   | Nei Guan (PC6)      | 6                 |
| 2   | Xuehai (SP10)     | 13                | 7   | Yanglingquan (GB34) | 6                 |
| 3   | Taichong (LR3)    | 13                | 8   | Huantiao (GB30)     | 6                 |
| 4   | Liangqiu (ST34)   | 13                | 9   | Xiangyu (ST43)      | 5                 |
| 5   | He Gu (LI4)       | 7                 | 10  | Shugu (BL65)        | 4                 |

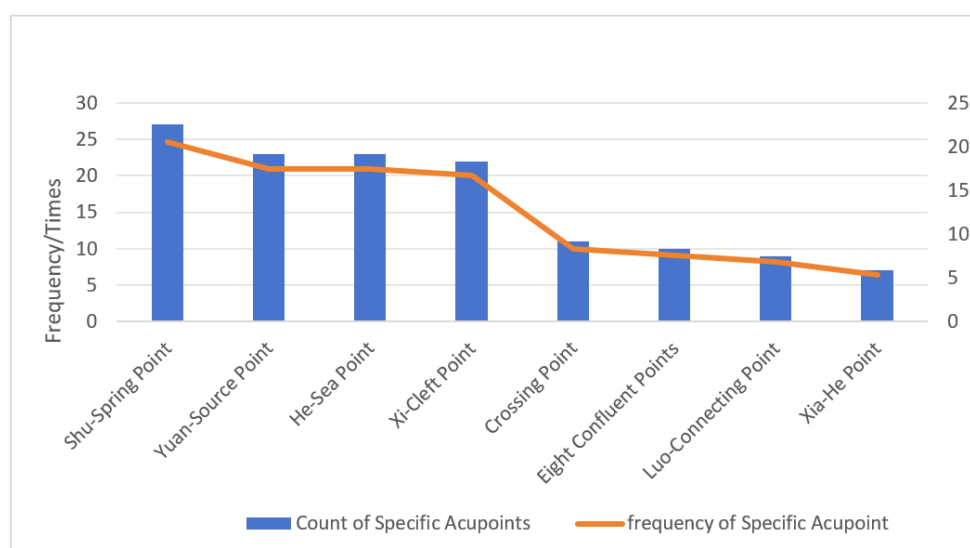
**Figure 1.** Table of high-frequency acupuncture points for acupuncture treatment of postoperative pain after hip replacement (Frequency word Top10).



#### Analysis of Specific Points for Acupuncture Treatment of Post-Hip Arthroplasty Pain

According to the data analysis, it was found that the 32 selected acupoints contained 8 specific points, with a total frequency of 132 occurrences, of which the most common were the lost points with a frequency of 27 times (20.45%), followed by the original points 23 times (17.42%), the merging points 23 times (17.42%), the Qie points 22 times (16.67%), the rendezvous points 11 times (8.33%), eight chakra rendezvous points 10 times (7.58%), complex points 9 times (6.82%), and eight chakra rendezvous points 7 times (5.30%), as detailed in **Figure 2**.

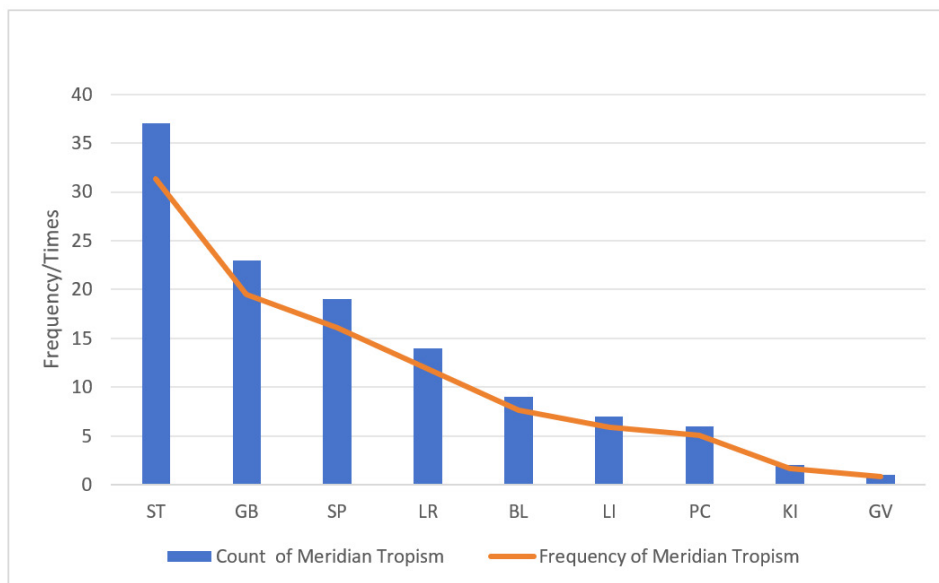
**Figure 2.** Analysis of specific acupuncture points for the treatment of postoperative pain after hip arthroplasty with acupuncture



Acupuncture points attributed to meridians for the treatment of postoperative pain after hip arthroplasty

According to the data analysis, it is known that of the 32 points selected, a total of 9 meridians and 3 empirical points (wrist and ankle needles) were involved. The highest frequency was 37 times (31.36%) for the Foot Yangming Stomach Meridian, followed by 23 times (19.49%) for the Foot Shaoyang Gallbladder Meridian, 19 times (16.10%) for the Foot Taiyin Spleen Meridian, 14 times (16.10%) for the Foot Syncopal Liver Meridian, 9 times (16.10%) for the Foot Solar Bladder Meridian, 7 times (16.10%) for the Hand Yangming Large Intestine Meridian and 6 times (16.10%) for the Hand Syncopal Pericardium Meridian, Foot Shaoyin Kidney Meridian 2 times (16.10%), and the Directing Vessel 1 time (16.10%) . Three of the experiences were, respectively, in the lower 4, lower 5, and lower 6 zones, as detailed in **Figure 3**.

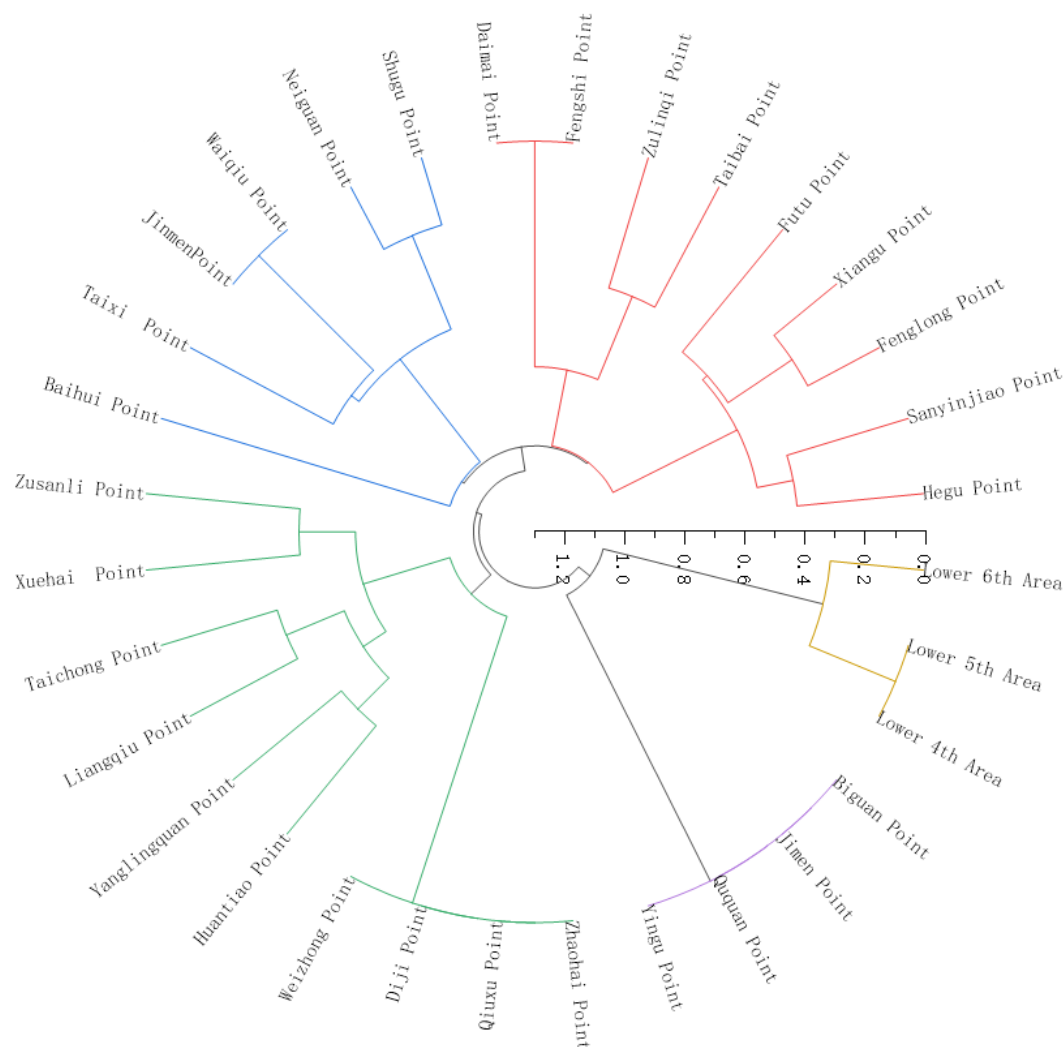
**Figure 3.** Acupoint attribution in the treatment of postoperative pain after hip arthroplasty by acupuncture



Systematic cluster analysis of acupuncture points selected for the treatment of postoperative pain after hip replacement

The systematic cluster analysis of acupuncture points selected for the treatment of postoperative pain after hip replacement was carried out by using the Origin 2024 software, and the clustering method used the intergroup linkage, and the binary variables were processed by using the Jekyll and Hyde similarity coefficients to make the spectrogram. By observing the spectrogram, it can be seen that acupuncture points for treating postoperative pain after hip replacement can be roughly categorized into five groups, as detailed in **Figure 4**.

**Figure 4.** Cluster analysis of selected acupoint system for acupuncture treatment of postoperative pain after hip arthroplasty



## Discussion

Pain after hip arthroplasty can be categorized as “paralysis”, “tendon injury”, “bone paralysis” and so on in Chinese medicine, and its pathogenesis is damage to the tendons and veins, stagnation of qi and blood stasis, and impassability of the meridians, which causes pain. Its treatment should be based on the principle of relaxing tendons and collaterals, moving qi to relieve pain, activating blood circulation and removing blood stasis. Acupuncture and moxibustion therapy can dredge the local qi and blood meridians, improve qi and blood circulation, promote metabolism, and harmonize yin and yang, so as to achieve the effect of pain relief.

A total of 22 articles were included in this study, involving 32 acupoints with a total frequency of 123 times, and the most common acupoints were Foot Sanli, Sea of Blood, and Taichong. The most common acupoints were Foot Sanli,

Blood Sea and Taichong. Among them, Foot Sanli appeared most frequently, belonging to the Foot Yangming Stomach Meridian and located on the lateral side of the lower leg. It is known as “qi and blood hundred rivers to the sea” point, is to reduce postoperative pain using the highest frequency of acupoints, some studies have found that acupuncture “foot Sanli” can significantly increase the patient’s pain threshold, play the role of analgesia<sup>[5][6]</sup>. Blood sea point, belonging to the foot Taiyin spleen meridian, is the “sea of twelve meridians”, is good at regulating qi and blood, through the regulation of all the veins, some studies have found that<sup>[7][8]</sup>, acupuncture blood sea point can effectively reduce the postoperative pain and inflammatory reaction of the hip joint, and promote the recovery of postoperative joint function. Taichong point, for the foot syncopal liver meridian in the transmission point, the original point, “liver main tendon”, “all tendons, all belong to the joints”, it is good at regulating qi and blood, the treatment of joint pain<sup>[9][10][11]</sup>.

The main specific acupuncture points for the treatment of postoperative pain after hip arthroplasty are the transmission points, the original points, and the combined points. The original point is the place where the original qi of the internal organs passes through and stays, and it is an important point for the circulation of qi and blood. Acupuncture at the original point can replenish the qi and blood, and soothe the tendons and activate the collaterals, and the “loss of the main body of the joints of the pain”, and acupuncture at the loss point is often used for pain relief. The joint point is the place where qi and blood converge, acupuncture can adjust the internal organs, dredge the meridians. The acupoints used in the treatment of postoperative pain after hip arthroplasty are mainly the foot yangming gastric meridian, foot shaoyang gallbladder meridian, and foot taiyin spleen meridian. The analysis of association rules showed that “Liangqiu-Blood Sea-Taichong”, “Foot Sanli-Blood Sea-Taichong”, “Blood Sea-Liangqiu-Foot Sanli”, “Taichong- Liangqiu-Footsanli” “Footsanli-Blood Sea-Taichong-Liangqiu” and other acupoint combinations are the combinations with the highest support and confidence level, which are useful as references for the treatment of postoperative pain after hip arthroplasty.

In conclusion, the selected acupoints for postoperative pain after hip replacement were mainly Foot Sanli, Blood Sea, Tai Chong and other acupoints; specific acupoints were mainly lost acupoints, original acupoints and combined acupoints; and acupoints attributed to the Foot Yangming Stomach Meridian, the Foot Shaoyang Gallbladder Meridian and the Foot Taiyin Spleen Meridian.

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