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Short Communication

Diachronic analysis of major acupoints used in ancient and current acupuncture treatments: Changes in main acupoints over time

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ABSTRACT

Background: Over time, a large body of knowledge on acupoint selection patterns has accumulated. This study compared the main acupoint selection patterns between ancient and current acupuncture treatments.
Methods: Data on the 10 most frequently used acupoints were obtained from a current medical database, the Cochrane Database of Systematic Reviews, and the ancient medical text Donguibogam. Network analysis was used to identify the most commonly used major points across various diseases.
Results: The most commonly used acupoints in both ancient and current acupuncture were ST36, SP6, LR3, LI4, and GV20. Acupoints CV3, CV4, CV6, CV8, and CV12 were more widely used in ancient acupuncture, while in current acupuncture, HT7, PC6, KI3, GB34, and EX-HN3 were more prevalent.
Conclusions: Ancient and current acupuncture practice had similar and distinct acupoint selection patterns. Diachronic analysis sheds light on how patterns of acupoint selection have changed.

Abbreviations
CDSR   Cochrane Database of Systematic Reviews

1. Introduction

Classic medical texts have amassed empirical clinical data on acupuncture treatment.[1] Over time, a vast amount of knowledge about acupoint selection patterns has accumulated and subsequently been lost.[2] In 1613, the Korean royal physician Heo Jun wrote Donguibogam, which described the theory and contemporary experiences of acupuncture treatments in East Asia at that time.[3] Acupuncture spread throughout Europe and other territories after Wilhelm ten Rhijne published a paper that introduced acupuncture to Europe in 1683.[4] In 1979, the Food and Drug Administration allowed licensed practitioners to use acupuncture in therapeutic settings, after it had been widely embraced by West-

ern societies.[5] Over the last 20 years, i.e., in the era of evidence-based medicine, more than 3000 articles on acupuncture clinical trials have been published,[6] and the clinical efficacy of acupuncture treatment for various illnesses has been proven by numerous studies.[7,8]

Data mining has revealed the acupoints targeted for certain conditions, such as dysmenorrhea and visceral pain.[9,10] Some acupoints are used only for specific problems, whereas others like ST36, SP6, LI4, and LR3 are used for a variety of diseases.[11] Practitioners participating in a virtual diagnostic procedure typically recommended needling these major acupoints.[12] Network analysis also revealed that the major acupoints tended to have a high degree of centrality and have been used frequently in diverse pain conditions.[13] Needling major acupoints has various neurological effects, such as descending analgesia and central regulatory effects.[14,15] Needling of the main acupoints has been advocated to increase the overall efficacy of acupuncture, based on Western notions of anatomy and physiology.[15] However, scant research has addressed the differences in acupoints selection patterns between ancient and current acupuncture treatment.

Therefore, this study compared acupoint selection patterns between ancient literature and current acupuncture treatments. We collected acupoint data from Donguibogam, a famous, classical Korean medical text, and the Cochrane Database of Systematic Re-

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Table 1
The 10 most frequently used acupoints in ancient and current acupuncture.

Rank	Donguibogam	Number of uses (percentage)	Rank	CDSR	Number of uses (percentage)
1	ST36	53 (11.3%)	1	SP6	176 (42.6%)
2	LI4	37 (7.9%)	2	ST36	149 (36.1%)
3	CV6	35 (7.4%)	3	LI4	137 (33.2%)
4	CV12	29 (6.2%)	4	LR3	137 (33.2%)
5	GV20	27 (5.7%)	5	GV20	134 (32.4%)
6	CV4	25 (5.3%)	6	PC6	118 (28.6%)
7	SP6	24 (5.1%)	7	HT7	73 (17.7%)
8	CV3	21 (4.5%)	8	EX-HN3	63 (15.3%)
9	LR3	21 (4.5%)	9	GB34	62 (15.0%)
10	CV8	20 (4.2%)	10	KI3	59 (14.3%)

views (CDSR), which is a contemporary medical database containing studies on acupoints.

2. Methods

2.1. Data extraction and processing

Donguibogam and CDSR contain data on acupoint selection. The "Acupuncture and Moxibustion Methods" of all subchapters of Donguibogam contained acupoints combinations for each disorders. The data source was gathered from the medical classics database website (https://mediclassics.kr/books/8). The names of acupoints from historical medical texts in Chinese were renamed with Standard acupuncture nomenclature. Criteria for CDSR studies have previously been detailed in full. The Acusynth database comprised acupoint combinations for 30 disorders from 30 CD-SRs.[12,16-18] Studies have described the major acupoint selection patterns in both ancient and modern practice.[3,17]

2.2. Data analysis

The acupuncture treatments described in Donguibogam used 471 acupoint combinations, while those in the articles in the CDSR used 413 combinations. The 10 most frequently used acupoints in Donguibogam and the CDSR studies were identified. We determined the most commonly used sets of acupoints for different diseases.

In addition, network analysis was conducted to uncover hubs of acupoints combinations both in Donguibogam and CDSR using Gephi (an open source software for graph and network analysis, version 0.9.2, http://gephi.org). The degree and betweenness centrality of each acupoint were calculated and visualized using Event Graph Layout. The position of the nodes on the Y-axis was determined using a rank order based on the number of degrees.

3. Results

3.1. Common and distinct major acupoints between ancient and current acupuncture treatments

Of the 294 acupoints in Donguibogam, 82 were used more than five times, while 106 of 262 acupoints were used more than five times in articles in the CDSR. We determined the top 10 most frequently used acupoints for both data sources (Table 1).

The most commonly used major acupoints in both Donguibogam and CDSR articles were ST36 ($n = 53$, 11.3% and $n = 149$, 36.1%, respectively), SP6 ($n = 24$, 5.1% and $n = 176$, 42.6%), LR3 ($n = 21$, 4.5% and $n = 137$, 33.2%), LI4 ($n = 37$, 7.9% and $n = 137$, 33.2%), and GV20 ($n = 27$, 5.7% and $n = 134$, 32.4%). Acupoints CV6 ($n = 35$, 7.4%), CV12 ($n = 29$, 6.2%), CV4 ($n = 25$, 5.3%), CV3 ($n = 21$, 4.5%), and CV8 ($n = 20$, 4.2%) were used frequently only in Donguibogam, whereas PC6 ($n = 118$, 28.6%), HT7 ($n = 73$, 17.7%),

EX-HN3 ($n = 63$, 15.3%), GB34 ($n = 62$, 15.0%), and KI3 ($n = 59$, 14.3%) were used frequently only in CDSR articles (Fig. 1).

3.2. Network analysis of acupoints used in ancient and current acupuncture treatments

We identified important acupoints for acupuncture treatment of a diverse range of illnesses through network analysis of acupoint selection patterns (Table 2). Network analysis revealed that 257 nodes and 2478 edges were found in Donguibogam, and 266 nodes and 891 edges were observed in CDSR articles. Acupoints LI4 (Degree = 48), ST36 (34), GV23 (29), GV20 (27), and CV6 (26) had the most links among all acupoints in Donguibogam, while ST36 (84), GV20 (83), GB20 (76), LI11 (72), and LI4 (70) had the most links among all acupoints in CDSR articles (Fig. 2).

LI4, ST36, and GV20 were shown to be common network hubs in both ancient and modern acupuncture treatments in the network analysis. In ancient acupuncture treatment, GV23, CV6, and CV3 were unique network hubs, whereas in modern acupuncture treatment, GB20 and LI11 were unique network hubs.

4. Discussion

By comparing the most frequently used acupoints between ancient and current acupuncture treatments, we discovered shared acupoints between the two eras (ST36, SP6, LR3, LI4, and GV20). Thus, these frequently used acupoints can be regarded as the major ones targeted by acupuncture practitioners. These findings were in line with prior findings that acupoints such as ST36, SP6, LI4, and LR3 are commonly used across a variety of disorders.[11,12] These major acupoints, the use of which can be traced back 400 years, differ in terms of indications.[13] Most major acupoints are distal to the knees and elbows, and produce an intense *deqi* sensation when needled. Given their locations and *deqi* sensations, the needling of these major acupoints may promote descending analgesia and central regulation of pain.[15]

In this study, acupoints CV3, CV4, CV6, CV8, and CV12 (in the belly) were found to be used more commonly in ancient acupuncture therapy. In Donguibogam, these acupoints were considered as the foundation of the five viscera and six intestines, and the source of the life force (*qi*). Accordingly, these acupoints were commonly the targets of moxibustion in ancient times. In comparison, HT7, PC6, KI3, GB34, and EX-HN3 are more commonly used in contemporary acupuncture. These acupoints, particularly HT7, PC6, and KI3, are the most important for emotional regulation and treating visceral dysfunction, and share many characteristics with other acupoints.[16] The changes in acupuncture practice between ancient and modern times can be attributed to the philosophical and empirical differences between the two periods. For example, there have been changes in the most common diseases (*e.g.*, *qi* deficiency may have been more common in ancient times) and clinical ap-
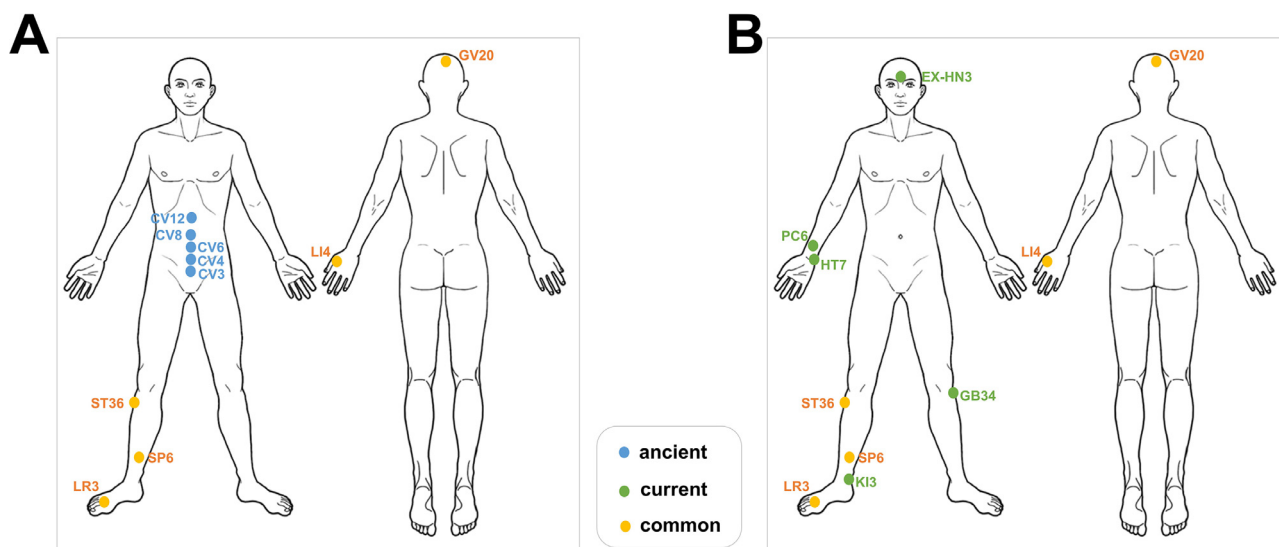
Fig. 1. Comparison of major acupoints between ancient and current acupuncture treatments. ST36, SP6, LR3, LI4, and GV20 were the most commonly used acupoints in both ancient and current acupuncture (in yellow). A) In traditional acupuncture, acupoints CV3, CV4, CV6, CV8, and CV12 were used more frequently (shown in blue). B) In current acupuncture, acupoints HT7, PC6, KI3, GB34, and EX-HN3 are used more frequently (shown in green). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)
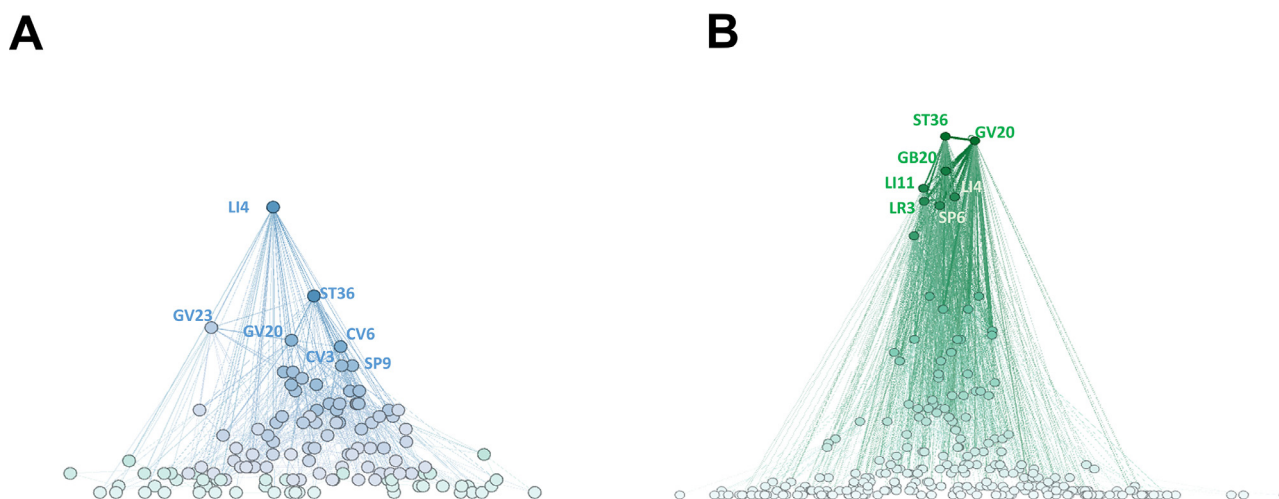

Fig. 2. Network analysis of acupuncture point selection in ancient and current acupuncture treatments. A) In ancient acupuncture, acupoints LI4, ST36, GV23, GV20, and CV6 had the most connections (shown in blue). B) In current acupuncture, acupoints ST36, GV20, GB20, LI11, and LI4 had the most connections (shown in green). The network analysis was done using Gephi. The position of the nodes on the Y-axis was determined using a rank order based on the number of degrees. The color of node was visualized based on the number of degrees. Acupoints with greater degree were darker, and the weight was illustrated by the width of the edges. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Table 2
The hub acupoints from network analysis in ancient and current acupuncture.

Rank	Donguibogam	Degree	Betweenness centrality	Rank	CDSR	Degree	Betweenness centrality
1	LI4	48	6693	1	ST36	84	4746
2	ST36	34	3680	2	GV20	83	4641
3	GV23	29	3282	3	GB20	76	4849
4	GV20	27	3331	4	LI11	72	4661
5	CV6	26	1557	5	LI4	70	2401
6	CV3	23	1936	6	LR3	69	2362
7	SP9	23	1261	7	SP6	68	1878
8	GV16	22	1292	8	BL23	61	2110
9	GV26	22	1812	9	CV4	47	1012
10	CV22	21	1433	10	GV24	47	1604

proaches (*e.g.*, moxibustion is now used more often than acupuncture for acupoints on the CV meridian).

One limitation of this study was our comparison of only two data sources. However, around 400 years ago, Donguibogam was the standard for acupuncture practice. The acupoint patterns described therein can thus be considered equivalent to clinical practice guidelines, where the book was written by a royal physician (Heo Jun) based on the most up-to-date findings published in East Asia at that time. We did, however, only look at one sample medical classic. It will be necessary to combine acupoints from diverse data sources throughout various time windows. The Acusynth database,[17] which describes the frequency of use of acupoints for 30 diseases based on CDSR studies, has the highest level of empirical evidence, and well-represents current trends in clinical acupuncture. Donguibogam and CDSR both cover a wide spectrum of disorders and the amount of data provided on acupoint selection is comparable between them. Therefore, the information on important acupoints provided by these data sources is useful for comparing ancient and modern acupuncture treatments. In conclusion, this study highlighted the similarities and differences in acupoint selection patterns between ancient literature and current acupuncture treatment. Future study is required to identify reasons for the changes in practice; we believe that further diachronic analysis will provide more information on how acupoint selection has changed over time.

Conflict of interests

The authors declare that they have no competing interests.

CRediT authorship contribution statement

Yeonjoo Yoo: Methodology, Formal analysis, Writing – original draft. **Yeonhee Ryu:** Project administration, Writing – review & editing. **In-Seon Lee:** Formal analysis, Methodology, Writing – review & editing. **Younbyoung Chae:** Conceptualization, Methodology, Visualization, Writing – original draft.

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Ethical statement

Not applicable.

Data availability

The authors can provide the data upon reasonable request.

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