

Explanation of the Evolution of Governor Vessel Moxibustion and Its New Instrument Design

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Abstract: Governor Vessel moxibustion, as a traditional external therapy, has obtained extensive clinical application and promotion in recent years. Through systematic collation of relevant literature, this paper conducts comprehensive analysis and elucidation regarding the theoretical foundations, historical origins, evolutionary trajectory, and characteristics of different schools of Governor Vessel moxibustion. Addressing existing limitations in current practices, we propose a novel Governor Vessel moxibustion device design aiming to facilitate operational standardization and protocolization, thereby providing new perspectives for the advancement and clinical implementation of this technique.

Keywords: Governor Vessel Moxibustion, Evolution, Literature Study, Medical Devices.

1. Introduction

The origin of the Governor Vessel moxibustion is from Sandwiched moxibustion therapy, modern by China's acupuncture and moxibustion practitioners from the folk traditional therapy tapped, and through the improvement and summary of the various medical practitioners, and gradually towards the systematization and standardization. The operation of Governor Vessel moxibustion is characterized by laying moxibustion material along the spinal column, like a long snake, moxibustion on the acupuncture material burning like a fire dragon, so it is also known as laying moxibustion, long snake moxibustion, dragon moxibustion, and so on. The moxibustion area is wide, and the volume is large, the time is long. the function of warming and dredging of meridians is powerful, general moxibustion can not achieve the same effect, it is through the stimulation the coordination of the meridians of the Governor Vessel meridian and bladder meridian of foot-Tai Yin, to achieve the dredging of the meridians, warming and tonify the qi of yang, promoting paralysis and pain relief, supporting the vital qi to deportation the pathogens, and regulating the effect of internal organs and so on. The author investigated and analyzed the theoretical foundation, origin and evolution of the Governor Vessel moxibustion, and cooperated with the team to develop a new type of therapeutic bed for Governor Vessel moxibustion, in order to solve the problems such as difficult to control the temperature during the moxibustion, easy to burn and inconvenient to operate, and to promote the standardization of the acupuncture and moxibustion operation. In the following, we will introduce the history and evolution of acupuncture and moxibustion, the design of the new acupuncture and moxibustion equipment and its characteristics and innovations.

2. Origin and Theoretical Basis of Moxibustion

Governor Vessel moxibustion is one of the traditional external therapies of traditional Chinese medicine, which is a kind of moxibustion method applied to the Governor Vessel. Three types of sources are generally recognized with regard to their origins. One of them believes that the origin of the acupuncture is from the moxibustion of the tiles in the

cauldron [1], which can be found in Ge Hong's book named "Zhou Hou Fang" [2]: "If there is a wandering pain and numbness symptoms, take about a dendro or so of dry moxa leaves, kneaded into a ball into the bottom of the tile jar, seal the other holes, leaving only one outlet, the pain area against the jar mouth, lighting moxa leaves smoked the affected area, after a period of time can be cured." In the Jin Dynasty, the court improved the method by placing the tiles along the governor vessel to apply moxibustion, and in the Qing Dynasty, the tiles were replaced with a lining of spacer drugs [3]. The second believes that the early stage of the Governor Vessel moxibustion was dominated by direct moxibustion at the Governor Vessel points [4]. Su Wen - bone empty theory" said: 'Moxibustion cold and hot methods, the first moxibustion item Dazhui (GV14),..... second moxibustion Changqiang (GV2), in the governor vessel points on the application of moxibustion. To the Jin Dynasty Ge Hong proposed Sandwiched moxibustion, both moxibustion and drug dual role, moxibustion force is gentle, the patient is easy to accept [5], on the basis of these, gradually formed a large area of Sandwiched moxibustion on the governor vessel. Thirdly, it is believed that the Governor vessel moxibustion has long been passed down in the folklore, and there is no official name and standard, until the modern day Zhejiang's Luo Shirong excavation, Shandong's Chong Guiqin was founded and named, because of its significant therapeutic effect in the treatment of ankylosing spondylitis and other diseases gradually promoted [6-7]. No matter what kind of origins, the governor vessel moxibustion always originated from the Sandwiched moxibustion and medicine ironing therapy, mainly based on the "<Suwen - Bone Emptiness Theory>: "The disease of the governor vessel is cured in the governor vessel points, the treatment is on the bone" and "Suwen - The theory of the regulation of meridian", "The disease is in the bone, quenching and medicine ironing" as the theoretical basis[8]. its formation is also based on the knowledge of acupuncture and moxibustion scholars on the site of moxibustion area and materials, and the mechanism of action of governor vessel moxibustion.

2.1 Moxibustion Site

The sites chosen for the application of moxibustion in each

school of Governor vessel Moxibustion are in the vicinity of the spinal column. Mainly for the section of the Governor vessel from the Dazhui (GV14) to the Changqiang (GV2), as well as the first and second lateral lines of the Bladder Meridian, He's methodology further selects single acupoints, multi-acupoints, or regional zones based on pathological patterns. <Zhuangzi·Yangsheng Zhu> highlights the Governor Vessel's role in "preserving vitality, sustaining life, Maintenance kinship, and fulfilling longevity" [9]. <Nan Jing·Chapter 28> states: "The Governor Vessel originates at the lower pole's acupoint, ascends along the spinal canal to Fengfu (GV16), and connects to the brain," emphasizing its anatomical and functional ties to the central nervous system [10]. The Governor Vessel can be seen as "the spinal cord's midline projection of the corticospinal tract" [11], a conduit for somatic motor regulation. <Investigations of the Eight Extraordinary Vessels> designates it the "Governor of Yang Meridians" and "Sea of Yang Meridians." The Governor Vessel can regulating qi and blood of Yang-channel and its interacting with the brain and spinal cord. Moxibustion here activates qi of Yang, modulates immunity and metabolism, and coordinates physiological activities. Some schools additionally target the Bladder Meridian adjacent to the Governor Vessel. <Suwen·Chapter 60> notes: "The Governor Vessel parallels the Bladder Meridian along the back, connecting to the kidneys." <Compendium of Acupuncture and Moxibustion·Fifteen Collaterals> observes: "The Governor Vessel's collateral diverges to connect with the Taiyang Bladder Meridian of foot-TaiYang." Zhang Zhicong of the Qing Dynasty thus concluded in <Annotations to the Spiritual Pivot·Back Transport Points>: "The Taiyang meridian and Governor Vessel meridians intercommunicate." Beyond this linkage, the Bladder Meridian shares an exterior-interior relationship with the Kidney Meridian, channeling Vitality qi of kidney. Its first lateral line hosts back transport points corresponding to zang-fu organs, enabling systemic functional regulation [12]. Consequently, moxibustion on the Bladder Meridian synergistically warms the Governor Vessel and kidneys while harmonizing visceral functions.

2.2 Moxibustion Materials

The primary materials for Governor Vessel moxibustion include ginger/garlic, moxa wool, and Governor Vessel moxibustion powder. Ginger or garlic juice serves as a medium, enhancing adhesion and transdermal penetration to optimize contact between buffer materials and acupoint layers for therapeutic potentiation [13]. Ginger can disperses cold and resolves exterior syndrome, warms the middle jiao and Dryness and dampness, and restores Yang to dredge meridians [14]. Modern pharmacology [15-16] confirms its anti-inflammatory, analgesic, antibacterial, antioxidant, immunomodulatory, cardiovascular-protective, and neuroprotective properties. Garlic can antioxidant, antitumor, and antimicrobial activities [17-18]. <The Compendium of Materia Medica> notes its capacity to "regulate the five zang organs, open orifices, dispel cold-dampness, expel pathogens, and reduce abscesses."

<The Compendium of Materia Medica> describes mugwort leaves as "capturing the sun's primordial fire and reviving collapsing primordial Yang." <Bian Que's Xin Shu> states:

"Among life-preserving methods, moxibustion ranks foremost." <Systematic Materia Medica > [19] adds: "Mugwort leaves permeate the twelve regular meridians, particularly targeting the liver, spleen, and kidney. They excel at warming the middle jiao, dispelling cold, eliminating dampness, and regulating qi-blood dynamics." Governor Vessel moxibustion integrates the pharmacological and thermotherapeutic effects of mugwort leaves to warm meridians, dispel cold, relieve pain, and harmonize qi-blood circulation.

Governor Vessel moxibustion powders are customized based on patient conditions [20]. <He's Herbal Patching Moxibustion Therapy> documents 46 formulations, including Bone Hyperplasia Powder and Xanthium Rhinitis Powder. By combining ginger/garlic, mugwort leaves, and specialized herbal powders, Governor Vessel moxibustion synergistically reinforces vital qi, eliminates pathogens, and achieves therapeutic and prophylactic outcomes [21].

2.3 Mechanism of Action

The combined effects of moxa effluvium, ginger/garlic-derived volatile compounds, and Governor Vessel moxibustion powder act synergistically on the body. Localized hyperthermia facilitates the penetration of integrated pharmacological actions, elevating regional and visceral tissue temperatures. This accelerates blood circulation and cerebrospinal fluid flow, enhances cellular metabolic activity, and modulates immune function and neuroendocrine regulation [22-23]. Blister-inducing moxibustion along the Governor Vessel segment activates neuroimmune peptides, reduces inflammatory exudation, enhances immune responses, and increases hypothalamic β -endorphin levels to exert central analgesic effects [24]. Integrating meridians, acupoints, herbal agents and moxibustion techniques, Governor Vessel moxibustion delivers concentrated therapeutic impact on pathological sites through synergistic actions. Its efficacy in warming meridians, dredge collaterals, dispelling cold, eliminating dampness, alleviating obstruction, and relieving pain enables broad clinical applications for disease treatment, prevention, and health maintenance.

3. Evolution and Characteristics of Governor Vessel Moxibustion Schools

Governor Vessel moxibustion, long practiced in folk traditions—particularly prevalent in the Jiangsu and Zhejiang regions—lacks explicit documentation in classical medical texts. <Beiji Qianjin Yaofang> states: "The spine and back serve as the body's structural pillars, anchoring the five zang organs and converging Yang meridians. Excessive heat from moxibustion may provoke heat pathologies" This underscores the ancient caution against intensive spinal moxibustion [25].

3.1 Luo's Patching Moxibustion

Professor Luo Shirong pioneered Luo's patching moxibustion by refining traditional Governor Vessel moxibustion, emphasizing treatment of Governor Vessel and kidney-related disorders. This method demonstrates exceptional efficacy for rheumatoid arthritis and ankylosing spondylitis (AS) [26].

Some literature attributes the formalization of patching moxibustion (long snake moxibustion) to Luo, initially developed as a single-disease therapy for AS [27].

Procedure: Target the Governor Vessel meridian segment from Dazhui (GV14) to Yaoshu (GV2). Sterilize the area, apply garlic juice, and spread self-formulated Ban She powder (a blend of cantharis and musk). Layer garlic paste and moxa cones over the powder. Apply 2–3 cones of moxibustion. Post-treatment erythema and blisters are drained on day 3 using sterile needles. Dry the area and apply gentian violet solution (every other day) until scabbing occurs. Enforce one-month post-treatment precautions: dietary avoidance of raw/cold/spicy/greasy foods and allergens; prohibition of cold baths, wind exposure, and sexual activity; mandatory rest.

Features: 1) Proprietary “Ban She powder” combined with garlic paste enhances warming and dredging efficacy [28]. 2) Induces large post-treatment blisters. 3) Prioritizes treatment timing—ideally during dog days of summer and daylight hours. **Limitations:** 1) Pungent garlic odor and intense cutaneous irritation. 2) Excessive thermal stimulation with poor temperature control, causing severe pain. 3) Time-consuming preparation and hazardous reapplication and cleaning processes. 4) High infection risk from extensive blistering and complex wound management, often resulting in scarring. 5) Significant moxa smoke emission impairs treatment environments and irritates respiratory tracts.

3.2 Chong’s Governor Vessel Moxibustion [7]

Professor Chong Guiqin refined Luo’s patching moxibustion through clinical observation, identifying its superior efficacy for ankylosing spondylitis (AS), and subsequently established a dedicated Governor Vessel moxibustion treatment center. Through iterative clinical trials addressing limitations of Luo’s method, she innovated by: Substituting garlic with ginger paste as the buffer material; Adding a mulberry paper layer between the medicinal powder and ginger paste; Redesigning the composition, dosage, and formulation processes of the Governor Vessel moxibustion powder to target AS pathology. These advancements, collectively termed “Governor Vessel moxibustion,” achieved optimal therapeutic outcomes, leading some scholars to attribute its formalization to Chong [22].

Key features: 1) Not restricted to the dog days of summer. 2) Switching to ginger puree for the liner and add the mulberry paper. control the blister formation in moderate area, reduces scarring, and enhances safety. 3) Disease-specific Governor Vessel moxibustion powder formulations for AS. **Limitations:** Narrow therapeutic scope, procedural complexity, retained blistering requirements, and persistent infection risks.

3.3 He’s Herbal Patching Moxibustion [29]

Professor He Tianyou refined Luo’s methodology by integrating TCM pattern differentiation principles, establishing a systematic herbal patching moxibustion therapy [30]. **Key features include:** 1) Customized Governor Vessel moxibustion powder formulations tailored to individual pathologies, exemplified by prescriptions like “Yaotu San”

(Lumbar Disc Herniation Powder) and “Zhike Dingchuan San” (Cough and Asthma-Relieving Powder), demonstrating pattern differentiation-based herb selection. 2) Innovation of “retention moxibustion”: After 3–5 moxa cones, the residual ginger paste and herbal powder are secured with adhesive tape for hours until warmth dissipates, prolonging therapeutic effects and dosage [30–31]. 3) Expanded treatment zones: Documentation of 225 single-acupoint and 62 regional application sites broadens clinical indications and enhances therapeutic precision [32]. **Limitations:** Despite advancements, He’s technique inherits operational complexities from Luo’s and Chong’s methods, including laborious procedures, infection risks from blister formation, excessive smoke emission, and insufficient safety protocols.

3.4 Cai’s Tongmai Wenyang Moxibustion

Developed by Professor Cai Shengchao through systematic refinement of existing Governor Vessel moxibustion techniques, Tongmai Wenyang Moxibustion represents a standardized and safer instrumental approach, classified among the 24 moxibustion methods of the Plum Blossom Acupuncture School [33–34]. The treatment targets the Governor Vessel meridian and the first lateral line of the Bladder Meridian in the lumbodorsal region. **Procedure:** Position the patient prone. Sterilize the treatment area and sequentially apply medicinal liquid and powdered herbs, covered by gauze. Place the Governor Vessel moxibustion box over the gauze. Layer ginger granules and moxa cones or segmented moxa sticks within the box. Ignite the moxa and cover the assembly with a large paper box for three cones of treatment [35].

3.5 Wu’s Long Snake Moxibustion

Professor Wu Jie identified limitations in traditional Governor Vessel moxibustion, including operational complexity, infection risks, and scar formation, prompting his development of the clinically optimized “Wu’s Long Snake Moxibustion” [36]. The procedure involves: Positioning the patient prone; Laying ginger slices sequentially over the treatment area. Placing a moxibustion box containing ignited moxa sticks along the spinal column atop the ginger slices. Adjusting the moxa sticks or box based on patient feedback during the 45-minute session. Removing the ginger and box post-treatment.

This method demonstrates key innovations: Ginger slices replace ginger paste preparation, simplifying material processing. 2) A specialized moxibustion box substitutes moxa cones, enabling precise heat modulation and sustained thermal uniformity. This reduces blistering, infection risks, and pain, improving patient tolerance. 3) Facilitates continuous treatment via incremental moxa stick replenishment, enhancing therapeutic dosage for conditions like chronic fatigue syndrome [37]. 4) Immediate box removal capability prevents burns, prioritizing safety.

4. Development Background and Design Concept of the Novel Governor Vessel Moxibustion Device

4.1 Research Background

Governor Vessel moxibustion has undergone iterative innovations by scholars such as Luo, Chong, He, and Cai, enhancing its applicability, safety, and therapeutic scope. However, persistent limitations remain. Our team advocates for optimizing efficacy while minimizing patient discomfort, with a focus on improving safety, standardization, and comfort. Preliminary research established a dose-effect relationship between ginger paste thickness and therapeutic outcomes in ankylosing spondylitis, while standardized protocols for moxibustion temperature control and cutaneous stimulation safety management were developed, providing a reference framework for clinical applications [38].

Operational challenges hinder broader adoption of Governor Vessel moxibustion. Patients endure discomfort during prone-position treatments lasting nearly one hour, exacerbated by heavy moxa tools and materials [39]. Prolonged prone positioning induces psychological stress and poor compliance. Operator variability further complicates practice, as the absence of unified standards leads to inconsistent temperature control and cumbersome procedures [40]. Additionally, moxa combustion generates substantial smoke containing tar, benzaldehyde, phenol, and aromatic hydrocarbons, causing air pollution, lingering odors, and respiratory irritation [41].

Existing domestic Governor Vessel moxibustion devices exhibit functional limitations: lacking automated temperature control, multi-mode treatment options, centralized unit management, clinical data storage capabilities, and interoperability with electronic medical record systems.

4.2 Design Concept

4.2.1 Overall Design

To address standardization challenges and operational limitations of traditional Governor Vessel moxibustion, we designed a novel therapeutic device integrating temperature control, smoke purification, multi-joint treatment, and high comfort. This innovation merges modern technology with traditional Governor Vessel moxibustion, enhancing efficacy while optimizing patient comfort. The device achieves the following functionalities: Automated temperature control, Automated smoke purification, Intelligent touch-control interface, Voice prompting, Multiple treatment mode options, Multi-joint therapy, Machine learning-based optimization of treatment protocols through Governor Vessel moxibustion data analysis, Centralized control of multiple devices via an intelligent platform, Data interoperability with electronic medical record systems for clinical research. The device incorporates eight therapeutic modules targeting the upper back, lumbosacral region, left/right upper arms, left/right thighs, and left/right calves, addressing multi-joint pathologies. The control panel allows preset adjustments of moxibustion temperature, target regions, and duration, with automated layered delivery of moxa wool and ginger. An internal smoke purification system minimizes environmental contamination. Treatment data are processed through backend analytics.

4.2.2 Automatic Lifting Device for Moxa Wool Tray

Utilizing microcontroller technology, the system automatically controls the vertical movement of the moxa wool tray based on temperature values detected by its integrated sensor, maintaining surface temperature within the preset range. To address operational risks caused by substantial tar accumulation from moxa combustion—which may adhere to moving components and induce malfunctions—a dedicated anti-smoke shield is incorporated to ensure long-term reliability. The tray's vertical motion employs a through-type lead screw stepper motor and linear guide rail mechanism, achieving compact structural design while reducing failure rates.

4.2.3 High-Efficiency Smoke Removal System

The combustion chamber employs stainless steel materials with a fully sealed structural design to prevent smoke leakage. Smoke is channeled through flues into the high-efficiency smoke removal system, which integrates sequential filtration layers: an oil-absorbing coarse filter, an HPEA high-efficiency filtration layer, and an activated carbon filtration layer. The exhaust air discharged after treatment is rendered safe and odor-free.

4.2.4 System Software Design Module

The system automatically regulates temperature based on treatment duration and temperature parameters set via the host computer, allowing real-time adjustments during operation. Each treatment unit incorporates independent mechanical and electronic regulation systems. After weighted averaging of temperature measurements from dual thermocouples, the system employs PID algorithms and stepped temperature control for precise thermal management.

The software automates airflow intake via specialized algorithms, adjusting ventilation levels according to the number of treatment zones and preset temperatures. Concurrently, it modulates the high-efficiency smoke removal system's fan operation based on treatment zone count and operational duration, thereby reducing noise.

4.3 Features and Innovations

4.3.1 High Comfort

The novel Governor Vessel moxibustion bed shifts patients from a prone to a supine position, resolving issues such as respiratory discomfort, fatigue, and psychological stress, thereby enhancing comfort. It adapts to the patient's spinal physiological curvature by adjusting cervical and lumbar contact surfaces for improved skin conformity. Automatic temperature control ensures the treatment unit regulates heat according to the display's preset temperature ($\pm 2^{\circ}\text{C}$ precision), preventing scalding risks. Integrated automatic smoke purification enables smoke-free Governor Vessel moxibustion therapy, minimizing respiratory irritation. These comfort-enhancing designs establish a foundation for prolonged moxibustion retention and extended therapeutic efficacy, reducing cutaneous reactions while preserving the characteristic high moxa dosage and potent thermal stimulation of Governor Vessel moxibustion.

4.3.2 Expanded Treatment Coverage

Traditional Governor Vessel moxibustion predominantly targets the Governor Vessel meridian and Bladder Meridian. This device expands therapeutic scope to eight modules: upper back, lumbosacral region, left/right upper arms, left/right thighs, and left/right calves, addressing multi-joint pathologies and broadening clinical applicability.

4.3.3 Intelligent and Personalized Design

The Governor Vessel moxibustion bed integrates an intelligent touch-control panel, with operations executed through an auto-folding touchscreen for user-friendly operation. Equipped with voice prompt functionality—including treatment completion alerts, error notifications, and operational guidance—it ensures standardized procedures. The system archives user treatment data with import/export capabilities, facilitating longitudinal therapeutic references for patients. Offering three treatment modes (Mode 1, Mode 2, and Custom Mode), it enables personalized protocols tailored to individual tolerance levels and historical usage patterns.

5. Conclusion

As a traditional Chinese medical therapy, Governor Vessel moxibustion exerts effects of warming the meridians, dredging collaterals, dispelling cold, eliminating dampness, alleviating obstruction, and relieving pain. Owing to its heat intensity and potent warming and dredging effects, it demonstrates remarkable efficacy in treating chronic conditions such as rheumatic immune disorders and deficiency fatigue. However, its widespread clinical adoption remains limited, primarily due to challenges in temperature control during application, uncomfortable patient positioning, significant smoke emission, and cumbersome operational procedures inherent to traditional techniques.

A comprehensive review of scholarly literature reveals the evolutionary trajectory of Governor Vessel moxibustion: modifications in buffer materials, heightened requirements for cutaneous responses and patient comfort, and the transition from indirect moxibustion to instrument-assisted moxibustion. These developments have progressively mitigated stimulation intensity, enhanced treatment safety and efficacy, and provided novel perspectives for clinical implementation. Although contemporary improved Governor Vessel moxibustion techniques [44-45] have addressed certain limitations of traditional practices, substantial inadequacies persist, failing to meet actual clinical demands.

The novel Governor Vessel moxibustion device developed by our research team innovates upon traditional techniques, offering advantages including comfort, safety, and simplified operation. It is particularly suitable for rheumatic immune diseases and subhealthy populations. This device has secured approval under the Nanjing Life and Health Technology Special Project and entered pilot clinical implementation. Practical evidence confirms that the standardized operation, enhanced comfort, and improved safety of this apparatus optimize patient experience while resolving historical challenges such as unregulated temperature control, pervasive moxa smoke, and insufficient safety protocols. Future efforts

will focus on developing updated models and expanding implementation across provincial/municipal hospitals, township clinics, and other medical institutions to promote standardized protocols and broader clinical adoption of Governor Vessel moxibustion.

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