

Review

Clinical Applications and Review of Acupoint GV-1

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ABSTRACT

The Governing Vessel (GV)-1 acupoint is known as *Hou-hai* in veterinary medicine and *Chang-qiang* in humans. Due to the perineum location, the clinical applications for GV-1 are very limited in humans and clinical research studies have also been insufficient compared to other acupoints. In contrast, the GV-1 acupoint in animals is convenient to locate and the results are significant for treating many digestive disorders which include diarrhea and constipation, as well as perianal diseases. Acupuncture at GV-1 can affect the function of many *Zang-fu* organs and according to both clinical studies and research has important diverse effects. Clinical benefits include treatment of gastrointestinal tract disease, perianal/perineal diseases, retained placenta, childbirth/labor/delivery, anesthesia recovery, epilepsy and behavior/cognition. In the present article, the varied clinical applications and research into the effects of GV-1 will be discussed both in veterinary medicine and human medicine.

Keywords: acupuncture, *Chang-qiang*, constipation, diarrhea, GV-1, *Hou-hai*, veterinary medicine

ABBREVIATIONS: 5-HT: 5-hydroxytryptamine; aqua-AP: aqua-acupuncture; BDNF: brain-derived neurotrophic factor; BL: Bladder; EAP: electro-acupuncture; FMR1: fragile X mental retardation 1; GI: gastrointestinal; GV: Governing vessel; LI: Large Intestine; PSD-95: postsynaptic density protein-95; SP: Spleen; ST: Stomach; TCVM: traditional Chinese veterinary medicine; TPH: tryptophan hydroxylase; WAIS-RC: Wechsler Adult Intelligence Scale-Chinese Revised

Governing Vessel (GV)-1, known as *Hou-hai* in veterinary medicine or *Chang-qiang* in humans, is located in the depression on the dorsal midline halfway between the anus and base of the tail. The Chinese name for GV is *Du Mai*; *Du* meaning to govern or dominate. *Du Mai* (GV) can dominate all *Yang* Channels, while GV-1 is the first point of the Governing Vessel Channel. The Governing Vessel courses cranially from GV-1 along the dorsal midline to the head (with an internal branch to the brain), so the head is known as the “gathering house of all the *Yang*”. An additional important internal branch of GV enters the pelvic cavity to reach the Kidney (root of pre-natal life).¹ Governing Vessel acupuncture can unblock all *Yang* Channels, strengthen the brain and nourish bone marrow, which can be used clinically to treat dementia and cognitive developmental delays.² According to a report on ancient literature indications of Governing Vessel use, acupuncture at GV-1 can calm the mind, promote the brain, strengthen Spleen, regulate the intestines, treat hemorrhoids and prolapse of the anus, regulate the back/spine and promote urination.³ Anatomically, the GV-1 acupoint is located in the coccyx site which contains the ganglion impar, which is the terminal ganglion of the sympathetic chain providing innervation to the perineum.⁴ The ganglion impar both provides pain sensation to the perineum, rectum and anus, as well as affects homeostasis of internal organs.⁵

In veterinary medicine, since GV-1 is easily accessible for acupuncture, it is commonly used to treat

gastrointestinal (GI) disorders (e.g. diarrhea, constipation), perianal diseases, and promote postoperative recovery in a multitude of species (horses, cattle, pigs, dogs, cats, exotic pets).⁶⁻⁸ Human acupuncturists, however, rarely place needles or perform moxibustion on this acupuncture point due to its location near the genitalia and concerns for patient modesty. Compared with other acupoints [e.g. Stomach (ST)-36], there is scarce clinical usage and research on GV-1 for humans. This article will summarize the clinical applications and research on GV-1 for both veterinary and human medicine.

CLINICAL APPLICATION OF GV-1 IN VETERINARY MEDICINE

In veterinary medicine, GV-1 can be used alone or in combination with other complimentary acupoints for treating disease and is especially effective for GI disorders. As a non-drug treatment technique, acupuncture at GV-1 in animals is safe with no toxicity or side-effects, and can

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produce immediate beneficial effects. The techniques used for GV-1 acupoint stimulation include acupuncture, moxibustion, electro-acupuncture (EAP), aqua-acupuncture (aqua-AP), acupoint catgut embedding, and massage.⁹⁻¹¹

Gastrointestinal Disease

Equine: Diarrhea is one of the most common clinical conditions in equine practice.¹² Even though equine diarrhea has different patterns according to traditional Chinese veterinary medicine (TCVM), this acupoint is considered a key point to stop diarrhea and is listed as one of the top 5 acupoints for any TCVM pattern of diarrhea.¹³ Based on pattern differentiation, 2 horses presenting with diarrhea were successfully treated with GV-1 combined with Bladder (BL)-20, BL-21, Spleen (SP)-6, and SP-3. Chinese herbal medicine and food therapy, based on TCVM pattern, were also combined with the acupoint prescription in these 2 clinical cases.¹³ Guo also treated equine diarrhea and constipation with aqua-AP at GV-1, and among the 81 diarrhea cases, 78 cases were cured by GV-1 point injecting 20 mL kanamycin (2 mL per vial contain 40000 units) once daily for 2-6 days. For 98 equine patients with constipation, 85 cases were cured by injecting 10-20 mL 10% potassium chloride solution at GV-1.¹⁴

Bovine: Laser acupuncture at GV-1 has demonstrated excellent efficacy to treat diarrhea in suckling calves.¹⁵ Moreover, orally taking Chinese herbal medicine according to the TCVM pattern combined with aqua-AP at GV-1 with 10 mL vitamin B1 and 10 mL vitamin B6 were effectively used for treating diarrhea and forestomach atony in cattle.¹¹

Small Animal and Wildlife: Chronic constipation accompanied by megacolon in middle-aged cats can be a frustrating disease for veterinarians to treat due to its poor response to medical therapy. A geriatric cat referred for a 22-month clinical history of intractable constipation and megacolon, which had not responded to conventional treatment, is described in a case report.⁷ After TCVM pattern differentiation, acupuncture technique was used to treat the cat's constipation and megacolon. The GV-1 acupoint was chosen to relieve constipation, combined with the complimentary acupoints BL-54, BL-15, and *Bai-hui*. The initial treatment began with dry needle acupuncture using 36g×0.5 needles to gauge the animal's tolerance for acupuncture. This treatment was well tolerated so the second treatment added EAP and aqua-AP five weeks later. EAP was used on bilateral BL-20, BL-21 and BL-25 with 20 Hz for 10 minutes, then 80-120 Hz for 10 minutes. Aqua-AP with 0.2 mL of a 50:50 solution of vitamin B12/sterile saline was used at ST-36 and ST-25 bilaterally. The therapeutic effects of the acupuncture only treatment, with emphasis on GV-1, ST-36 and *Bai-hui*, significantly improved the cat with return to normal bowel movements after 5 monthly treatments.⁷

For intractable diarrhea non-responsive to multiple types of treatment, or for dogs and cats with severe anxiety and/or marked aggression, treatment with GV-1 catgut implantation was effectively used. This treatment reduced frequency of animal handling along with decreased drug

doses.⁸ Repeated handling is also problematic when dealing with wild animals. The authors suggested the GV-1 catgut implantation technique may be an effective method for treating diarrhea in these patients too.

Porcine: Although not a controlled study, Sun used aqua-AP with pefloxacin mesylate injection and the Chinese herbal medicine *Huang Qi* (Astragalus) polysaccharide injection at GV-1 to treat infectious diarrhea in pigs with great success.¹⁰

Anesthesia

Reptile: Cerreta et al. reported that dry needles at GV-1 and GV-26 during anesthesia of turtles can reduce the recovery time from anesthetics and decrease the occurrence of postoperative complications.¹⁶ Anesthesia in the study was induced by intramuscular injection into the triceps muscle complex with 1.5 mg/kg morphine, 7.0 mg/kg ketamine and 100 µg/kg dexmedetomidine.

Placenta Retention

Porcine, Equine, Bovine: Sun successfully demonstrated aqua-AP at GV-1 with oxytocin was effective for treating porcine placenta retention.¹⁰ According to one report, 13 cases of equine placenta retention were treated by aqua-AP at GV-1 using diethylstilbestrol. Twelve cases were resolved, with only one case ineffective.¹⁴ Additionally, the acupoint has been reported to effectively treat retained placenta in cows.¹⁷ A study using 30 pregnant cows injected with 40 mL (40 grams) of *Dang Hong Fu* herbal solution at GV-1 immediately after calving were compared to 22 control cows injected with 40 mL of saline. The *Dang Hong Fu* herbal solution contained *Dang Gui* (Angelica), *Hong Hua* (Safflower), *Yi Mu Cao* (Motherwort), *Huang Qi* (Astragalus), *Pao Jiang* (Dried Ginger) and *Che Qian Zi* (Plantain Seed). Results indicated that *Dang Hong Fu* herbal solution injected at GV-1 could shorten the placenta retention time (14.7 hours controls versus 9 hours aqua-AP group, $p=0.047$) and reduce the incidence of placenta retention, with no adverse reactions.¹⁷

CLINICAL RESEARCH OF GV-1 IN VETERINARY MEDICINE

Gastrointestinal

Kim et al. have published several clinical research papers on the use of GV-1 to treat GI diseases in rats and dogs.^{18,19} One of the papers demonstrated that dry needle stimulation of GV-1 could inhibit proximal colon movement. This occurred by reducing the total duration and frequency of colon contraction, which has significant benefit for treating canine diarrhea.¹⁸ They also compared the action of GV-1 with 9 other acupoints and showed that none of the other 9 points had any significant effect on proximal colon movement. The 9 acupoints were Large Intestine (LI)-1, LI-2, LI-3, LI-4, LI-5, LI-6, LI-11, ST-25, and BL-25.¹⁸ Another study in a rat colitis model showed that acupuncture at GV-1 had significant therapeutic effects on colitis by decreasing colonic motility and alleviating mucosal inflammatory damage through significant anti-

inflammatory effects (decreasing myeloperoxidase activity). Pretreatment with naloxone blocked these effects. The authors proposed the mechanism of action may involve endogenous opioid pathways which have important roles in control of motility, secretion, and absorption in the GI tract.¹⁹

Aqua-acupuncture

At present, research on GV-1 aqua-AP therapy is limited. One study demonstrated that GV-1 acupoint injection has a number of beneficial therapeutic effects. These include: dose reduction of Chinese herbal medicine by 20-50%, improved clinical curative effect by 10-20%, shortened treatment time, and duration of curative effect can be prolonged.²⁰

Reginato et al. compared GV-1 injection to intravenous injection of flunixin meglumine following equine castration for control of inflammation and pain. After recovery from anesthesia, an onsite evaluator unblinded to the treatments immediately analyzed the footages and scored the animals using two pain scales: 1) heart rate and behavior signs, and 2) grimace scale. Two other experienced observers, who were blinded to the treatments, received the videos of each animal to evaluate and characterize their behavior using both pain scales. The results showed that there was no significant difference between GV-1 injection of 0.11 mg/kg flunixin meglumine when compared to intravenous injection of 1.1 mg/kg flunixin meglumine. GV-1 acupoint injection of one tenth of the drug dosage could produce similar effects to conventional dose and route.⁶

Scallan et al. compared the effects of intramuscular injection of dexmedetomidine to GV-1 acupoint injection in healthy cats. The results showed that the same dose of dexmedetomidine injected at GV-1 acupoint had a stronger analgesic effect than intramuscular injection, but without any difference in sedative effect and heart rate.²¹

Another study claimed that GV-1 aqua-AP could successfully relieve canine diarrhea.²² This study used a canine diarrhea model induced by intragastric administration of *Fan Xie Ye* (Folium Sennae) decoction at a dose of 6 mL/kg. Once the model was successfully established, the experimental group received aqua-AP treatment at GV-1 with a *Huang Qi* (Astragalus) polysaccharide injection (0.25 mL/kg) twice daily. After 4 days of treatment, the diarrhea symptoms were significantly improved, and the white blood cell numbers were very significantly reduced compared to the diarrhea model control group.

CLINICAL APPLICATION AND RESEARCH OF GV-1 IN HUMANS

In human medicine, GV-1 is mainly used to relieve pain after hemorrhoid surgery, treat pediatric diarrhea and constipation, treat genitourinary and perianal diseases, and cognitive dysfunction.²³ The therapeutic effects of acupoints are mainly manifested in three aspects: near treatment, far treatment, and special treatment.²⁴⁻²⁶

Proximal therapeutic effect means that acupoints can treat diseases in and near their location. GV-1 is located between the coccyx and anus, so it exerts local effects in that area.^{25,26}

Perianal Diseases and Surgery

Wang used single point dry needle at GV-1 to treat 80 patients with pain due to *Qi* Stagnation and Blood Stasis after anorectal surgery.²⁷ Dry needles were placed at GV-1 for 20 minutes. After one treatment, pain symptoms of all patients were improved, and the clinical effect was satisfactory. Another study investigated 120 cases of mixed hemorrhoids treated with a surgical procedure. The study demonstrated that pretreatment with electroacupuncture at GV-1 and BL-57 acupoints at 15 Hz for 20 minutes could relieve postoperative pain, reduce the dosage of analgesic drugs, and increase the sleep time of patients on the night after the operation.²⁸ Wang et al. used a catgut embedding technique at the GV-1 acupoint to treat 180 patients with postoperative pain of hemorrhoids. The catgut was embedded into the GV-1 area to give continuous stimulation to the acupoint. Study results found that after the catgut embedding technique, 94.4% of the 180 patients with postoperative hemorrhoid pain had significant pain relief.²⁹

Brain and Cognition

Since the primary pathway of the Governing Vessel reaches upward to the head, with an internal branch to the brain located on the lower border of the occipital bone (GV-16); GV-1 is commonly used in human medicine to treat brain disease (far treatment).²⁴ A multi-center clinical research study collected 115 children with cognitive developmental delays. There were 57 children with an average age of 6-year-old treated by dry needle at GV-1 twice a week for 3 months. They assessed and compared them before and after treatment with Infants-Junior Middle School Student Social-Life Ability Scale and Wechsler Adult Intelligence Scale-Chinese Revised (WAIS-RC). They found that acupuncture at GV-1 not only improved the score of WAIS-RC of children with cognitive developmental delays, but also improved their social adaptability compared with the control group.³⁰

Gastrointestinal Diseases

Acupuncture can exert dual regulation, therefore, many clinical and research applications have demonstrated that GV-1 not only treats diarrhea, but also can relieve constipation.³¹ In clinical research to relieve constipation, Ren used dry needles at GV-1, ST-25, ST-36 acupoints and moxibustion at *Bai-hui* once a day for 15 minutes. After 10 days of continuous treatment, 79% of the 160 patients showed improvement.³¹ Liu randomly divided 84 children (1-7-year-old) that had diarrhea into 2 groups. The results showed that dry needle acupuncture at GV-1 combined with massage was more effective in treating infantile diarrhea when compared with the control group. The author believed that acupuncture and massage was simple to perform, had no adverse reactions and would be a great method to treat infantile diarrhea.³² Another clinical study

showed that 120 cases of infantile diarrhea were treated by acupuncture at GV-1 and ST-36 acupoints, with the total effective rate reaching 95%.³³

Childbirth, Labor and Delivery

GV-1 also has potential to benefit labor and delivery in women. A clinical study showed that 300 primiparas were randomly divided into two groups, after entering the second stage of labor. The test group was given massage at the GV-1 acupoint, while the control group did nothing to stimulate GV-1. The results showed that massage at GV-1 shortened the second stage of labor and improved the natural delivery rate compared with the control group.³⁴ Another study showed that combining massage at GV-1 with pelvic floor muscle rehabilitation training was beneficial for women after delivery under epidural anesthesia. Massage at GV-1 combined with rehabilitation effectively reduced the incidence of postpartum urinary retention, improved post-partum mental depression, and promoted spontaneous urination.³⁵

Li treated 500 patients with pelvic inflammatory disease which were divided into a control group of conventional medical treatment only or investigational treatment which consisted of injection of antibiotics combined with lidocaine at the GV-1 acupoint. Retrospective analysis of the results showed that GV-1 aqua-AP (with targeted medications) could shorten the treatment course. The authors concluded that GV-1 acupoint treatment has benefit in clinical settings.³⁶

Wang et al. documented clinical observations of treating perineal pain syndrome with injection of anesthetics at GV-1. This aqua-AP technique was observed to be a safe and effective therapy for diminishing perineal pain along with nerves of the associated lumbosacral-sciatic plexus.³⁷

BASIC RESEARCH STUDIES ON GV-1

Mechanism of GV-1 in Treating Diarrhea and Constipation

The GV-1 acupoint is used both in veterinary clinics and human medicine to treat various digestive diseases. The author's research team has investigated the therapeutic effect and mechanism of dry needle stimulation of GV-1 on diarrhea and constipation using a rabbit diarrhea model induced by oral intake of *Fan Xie Ye* (Senna Leaf) decoction. Results showed that dry needle acupuncture at GV-1 once daily for 7 consecutive days had a number of significant effects. These included reduction of serum levels of motilin (MTL) ($p<0.05$) and vasoactive intestinal peptide (VIP) ($p<0.05$). There was a decreased expression of Substance P ($p<0.01$) and tryptophan hydroxylase (TPH) ($p<0.01$) in small intestine tissues of the rabbits with diarrhea. In addition, GV-1 could increase the content of enterochromaffin cell (EC) ($p<0.01$) and ion channel aquaporin4 (AQP4) in small intestine tissues ($p<0.01$), as well as promote the expression of Na⁺/H⁺ exchanger 3 (NHE3) ($p<0.01$). The results indicated that GV-1 regulated gastrointestinal peristalsis by acting on local

gastrointestinal nerves, regulating the abnormal gastrointestinal hormone content and increasing intestinal ion channels.^{38,39}

A rat constipation model induced by loperamide was used for the constipation study.⁴⁰ The effects of GV-1, ST-36, and BL-25 on relieving constipation and regulating neurotransmitters related to gastrointestinal movement were compared. Dry needle acupuncture was used once daily for 7 consecutive days. All three acupoints would relieve rat constipation, but GV-1 had the best clinical results. Acupuncture at GV-1 improved GI motility ($p<0.05$), down-regulated the serum content of somatostatin (SS) ($p<0.01$) and 5-hydroxytryptamine (5-HT) ($p<0.05$), as well as reduced the 5-HT protein expression in colon tissues.⁴⁰ In order to further explore the effects and mechanism of GV-1, a randomized controlled trial was conducted comparing 3 different techniques in the rat constipation model. The 3 techniques were GV-1 dry needle acupuncture (once daily for 7 days), GV-1 aqua-AP (once daily for 7 days), and GV-1 catgut embedding (only once). Results showed all 3 acupuncture techniques could regulate abnormal neurotransmitters, inhibit the production of TPH, and effectively improve the 5-HT reuptake transporter (SERT) protein level in colon tissue. Additionally, the excessive 5-HT in synapses was cleared, numbers of goblet cells were increased, and there was improved intestinal mucus secretion. Among them, catgut embedding and aqua-AP at GV-1 proved better than dry needle only technique.^{41,42}

Another study indicated that acupuncture at GV-1 could down regulate the abnormal expression of somatostatin receptor subtype 2 (SSTR2) in the gastric antrum and brain along with improving mucosal inflammation in mice with Damp-Heat diarrhea syndrome.⁴³ Wang et al. studied the anti-diarrhea effect of injecting *Chuan Xin Lian* (Andrographis) and berberine at GV-1 using a mouse diarrhea model.⁴⁴ Aqua-acupuncture at GV-1 with berberine inhibited intestinal peristalsis and significantly reduced the incidence and frequency of experimental diarrhea in mice caused by *Fan Xie Ye* (Senna Leaf) and hypertonic magnesium sulfate solution. The study also showed that EAP at ST-36 and GV-1 effectively improved neurogenic fecal incontinence of mice, and its mechanism may be related to increasing anorectal pressure and enhancing the electrical activity of the external anal sphincter.^{23,45}

GV-1 Studies for Regulating Perianal and Somatic Pain

A study using the rat colitis model revealed that acupuncture at GV-1 could relieve somatic pain caused by colitis.⁴⁶ Pretreatment with naloxone, a non-specific opioid antagonist, can eliminate the pain relieving effect of GV-1 on colitis in rats, indicating that an endogenous opioid pathway may be involved in regulating the effect of GV-1.⁴⁷ Another study showed that the skin adjacent to the GV-1 acupoint was sensitive and showed neurogenic inflammation in rats with colitis, which did not appear under normal conditions.⁴⁸ Shu showed that GV-1 acupoint implantation can significantly increase the mechanical pain

threshold of rats with anal incision pain. The mechanism may be related to a decreased level of phosphorylated p38 mitogen-activated protein kinase (P-p38 MAPK) in the rat's spinal cord associated with incision pain, while non-acupoint implantation didn't exert the same effect.⁴⁹

Mechanism of GV-1 for Treating Epilepsy and Improving Cognitive Function

EAP stimulation of GV-1 can change expression of the apoptosis-related protein (c-fos) gene in the hippocampal CA1 area of experimental animals, and could improve the cognitive ability of children with cognitive impairment.⁵⁰ One study used a rat epileptic model induced by penicillin sodium. The rats were pretreated with catgut embedding at GV-1 and *Bai-hui* followed by observation of the effects on behavior and electroencephalogram (EEG). Acupoint catgut embedding pretreatment reduced the number and degree of seizures, and had a good effect on controlling seizures.⁹

Han et al. found that acupuncture at GV-1 could up-regulate brain-derived neurotrophic factor (BDNF) expression in the hippocampal CA1 region of FMR1 knockout mice.⁵¹ Another study discovered that EAP at GV-1 could promote the expression of PSD-95 protein (major regulator of synaptic maturation) in the hippocampus of FMR1 knockout mice.⁵²

A rat autism model was established by intraperitoneal injection of sodium valproate (600 mg/kg) in Wistar pregnant rats. In-utero exposure to VPA results in rats with changes which result in autism-like behaviors similar to in-utero exposed children with VPA-induced retardation resembling autism. Autism model production was confirmed by evaluating age appropriate neurological function tests in exposed pups.⁵³ Zhang and Wu found that EAP at GV-1 or *Bai-hui* acupoints could improve the learning and memory abilities of subjects in a rat autism model. The mechanism may be related to regulation of PSD-95 protein expression.⁵⁴

Lai reported that EAP at GV-1 improved learning and memory performance of autism rats through strengthening the expression of BDNF and tyrosine kinase B protein in the hippocampus of subjects.⁵⁵ Another study found that GV-1 acupuncture intervention could improve the learning and memory abilities of autistic rats, which may be closely related to its role in up-regulating the expression levels of connexin (CX) 43, CX32, and CX36 in the frontal cortex.⁵⁶ A different study also showed that EAP at GV-1 could increase the content of nerve growth factor in the brain, which is beneficial to repairing damaged cranial nerves.⁵⁷

SUMMARY AND PROSPECTS

According to modern research, a living organism is a composite of a number of complex systems, and is not a simple overlap of these organs and systems. It is the integration of countless interconnected networks of different levels.⁵⁸ The mechanical stimulation of an acupuncture point excites local nerves and activates cell functions related to acupoints. This starts a cascade of

events that induces the organism to produce corresponding biological effects, such as the release of neurotransmitters, cytokines, and hormones, which are transformed into biological information by the physical stimulation. Although acupuncture does not use drugs, the effect of acupuncture is a multi-channel and multi-level complex regulation, which prevents and treats diseases similar to a pharmacological process.⁵⁹

Studies have shown that acupuncture at GV-1 can affect the functions of many organs and systems of the body through various mechanisms. Previous studies completed by the author's team (rabbit diarrhea model, rat constipation model) has shown that acupuncture stimulation of GV-1 changed the expression of gastrointestinal hormones, neuropeptides, goblet cells, and Substance P protein in the intestine through a "neural-endocrine-immunoregulation network" which is complex and multi-layered. At present, research on the function and mechanism of GV-1 is only the tip of the iceberg, and further research is needed to provide theoretical support for the clinical popularization and usage of GV-1.

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