

Electric Plum-Blossom Acupuncture Therapy: An Overview from a Modern Medicine Perspective

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Abstract

Electric plum-blossom acupuncture therapy, which combines skin stimulation, meridians, and acupoints, has been very effective in some diseases. An overview of electric plum-blossom acupuncture therapy is provided in this article. Further, this article summarizes the mechanism of action, the method of adding electricity, clinical treatment, indications, contraindications, and adverse events reports of electric plum-blossom acupuncture.

Keywords: Electric plum-blossom acupuncture therapy; Electro-acupuncture; The method of adding electricity

Introduction and Brief History

Plum-blossom acupuncture therapy prevents and treats diseases by tapping a particular part of the body surface, acupoint, or meridian circulation route with a needle, a bundle of short needles combining multiple stainless, also known as a dermal needle [1]. Developed from ancient methods such as 'Semi-acupuncture' and 'Central-square needling', plum-blossom acupuncture therapy is a superficial method of acupuncture that has been used since ancient times. As one end of the needle handle is equipped with seven short needles, resembling a plum blossom shape, it is referred to as a 'Plum-blossom needle'. Children are easy to accept because of its shallow stimulation site, less pain when tapping, and safety, hence the term 'pediatric acupuncture' [2]. Plum-blossom acupuncture therapy is an important component of Traditional Chinese Medicine. The technique has been documented for over 2000 years in 'The Yellow Emperor's Internal Classic,' a foundational text on acupuncture.

'Miraculous Pivot-Guanzhen' mentioned that 'Semi-acupuncture, acupuncture on the superficial part of the skin due to the impediment 'and' Central-square needling is a needle in the middle of the acupuncture point, and then a needle is shallowly pricked on the upper and lower left and right, which is used to treat diseases where cold retention, extensive area, and shallow disease location [3]. Plain Question-Ciyaolun 'explains: 'Disease has the difference between exterior and interior, and the acupuncture method has the difference between superficial and deep acupuncture. Diseases on the exterior should be superficially acupuncture, and diseases in the interior should be deeply acupuncture'. These acupuncture theories laid the foundation for developing and improving plum-blossom needles for later generations [4]. Electro-acupuncture therapy has a long history of research and application, and the first physician to apply electricity to acupuncture needles in medicine was the French physician Barry Waltz, who proposed that the electrical stimulation generated by the battery can enhance the therapeutic effect of acupuncture [5].

In the 1950s, Chinese doctor Zhu Longyu formally proposed electro-acupuncture therapy and successfully piloted the development of an electro-acupuncture therapeutic apparatus [6]. By replacing long-term needle manipulation, electro-acupuncture saves time and effort, allows objective stimulation control, improves therapeutic effect, and is easy to popularize [7]. Electric plum-blossom acupuncture has been around since the late 19th century and combines skin stimulation, meridian and acupoint, and electro-acupuncture to create a more powerful therapeutic effect. This article aims to review and summarize the mechanism

of action, the method of adding electricity, clinical treatment, indications, contraindications, and adverse event reports of electric plum-blossom acupuncture to provide some new ideas for future research.

Mechanisms of Action and Reported Effects of Electric Plum-Blossom Acupuncture Therapy

Electric plum-blossom acupuncture therapy belongs to the category of Western medicine physical therapy, and its main mechanism is as follows:

A. Electric plum-blossom acupuncture gives a certain degree of stimulation to acupoints by tapping, which causes the nerve endings or receptors of the human body to produce effects, which then transmit the stimulation signal to the central nervous system through nerve reflexes, which are integrated and analyzed by the centre, activate the nerve cells, promotes neuronal function recovery, and send signals to the motor terminals to correct the abnormal mode. The neurological function is improved by increasing neurons' excitability and promoting their conduction speed through electrical stimulation [8].

B. By shallowly pricking the skin with plum-blossom acupuncture, the stimulation transmits acupuncture signals to the spinal cord via the thick fibres of sensory nerve endings,

which prevent the noxious stimulation from entering the spinal dorsal horn by closing the sluice gates of the astrocytes, and nerve fibres are sequentially excited from the thick fibres, leading to an analgesic effect [9].

C. Electric plum-blossom acupuncture can make the lesion tissue congested and heated, improve local blood circulation and increase blood flow while improving vasodilatation, thereby improving the supply of oxygen and nutrients to the tissues, reducing edema and improving immunity, and restoring nerve function by reducing damage caused by compression [10].

D. Electric plum-blossom acupuncture therapy can enhance muscle function by increasing muscle strength and endurance through the contraction of muscle fibres by stimulation with electric current [11].

E. Based on the findings of Sun et al. [12]. plum-blossom acupuncture exerts its therapeutic effects primarily through the 'pain reflex'. When a painful stimulus is applied to the body's muscle surface, the nerve impulses generated by the pain receptors are connected to internal organs via afferent and autonomic nerves. In response to the stimulus, the neurohumoral system releases a series of cytokines and active substances that regulate the immune and endocrine systems (Figure 1).

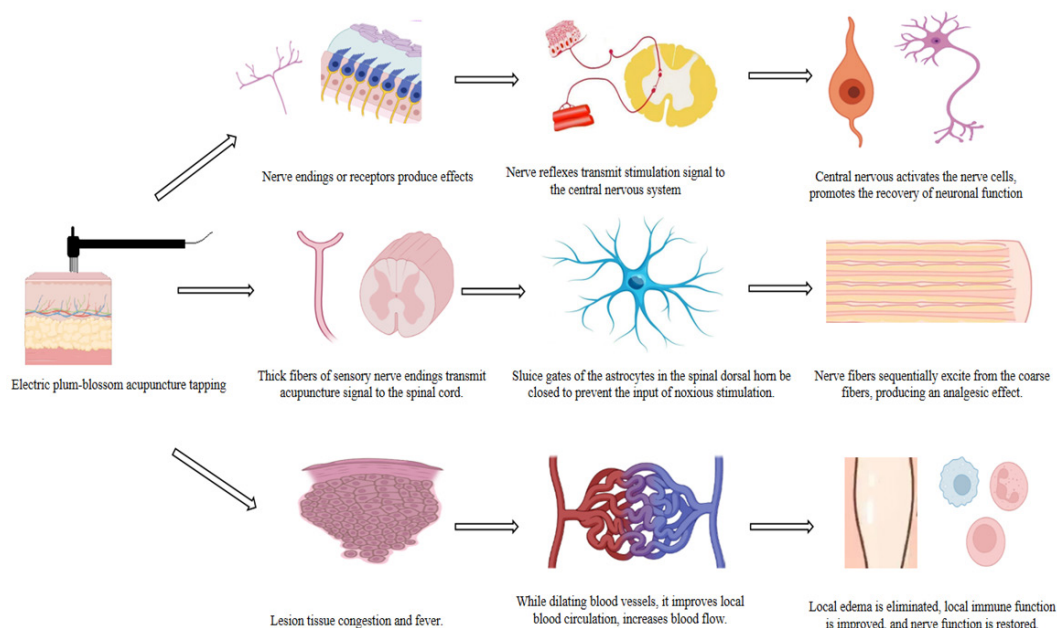


Figure 1: Mechanisms of action of electric plum-blossom acupuncture therapy.

The Development Process of the Electric Plum-Blossom Acupuncture Treatment With the Method of Adding Electricity

Beginning in the 1950's

Since the 1950's, electric plum-blossom acupuncture has been used to treat various diseases. Doctors commonly attached one pole of the output wire to the needle body of the plum-blossom acupuncture and handed the other pole, connected to a copper

cylinder, to the patient to hold. The electro-acupuncture instrument was then turned on, and the plum-blossom acupuncture was tapped on a specific area to treat the disease. The electric plum-blossom acupuncture treatment with this method of adding electricity is easy to operate, eliminating the inconvenience of long-term manual operation, but it also has obvious shortcomings. In the last century, electro-acupuncture was still in the exploratory stage. It could not guarantee that the copper cylinder gripped by the patient was conducting electricity [13,14].

Developing in the 1980's

After the 1980's, many doctors began to explore different methods of adding electricity to the electric plum-blossom acupuncture treatment, making it more effective. Bai et al. [15] drilled a small hole above the plum-blossom acupuncture, unscrewed the needle plate, removed a small lead skin, and penetrated the wire from the spot. One wire was on the lead skin with a soldering iron, and the other was welded on the power plug. Then put the lead skin back in place to screw the needle plate on. Thus, it is more efficient, provides constant strength, and is easier to operate. Zhang et al. [16] connected two output wires of an electro-acupuncture instrument, one to the plum-blossom acupuncture and the other to an electrode on the affected limb's Yanglingquan point (GB34). The affected area and needles were sterilized, and the electro-acupuncture instrument was activated, producing dilatational wave frequencies of 16-300 times/min. This electric plum-blossom acupuncture treatment is easy and safe to operate, with strong effects.

Maturing in the 21st century

A new digital electric plum-blossom acupuncture combines micro-pulses of electricity with plum-blossom acupuncture, with adjustable therapeutic parameters to realize automatic tapping instead of manual tapping, was developed by Xu et al. [17]. It drives the needle to vibrate up and down using an alternating current, producing a tapping action and a micro-pulse current that acts on the treatment site. With this new technology, the intensity and frequency of plum-blossom acupuncture movement can be accurately adjusted for different diseases, enhancing the curative effect by forming a circulation circuit in the patient's skin. This instrument is not limited to clinical treatment but can also be used for family health care.

Indications Contraindications

Electric plum-blossom acupuncture treatment has been used to prevent and treat diseases for many years. It is beneficial to many diseases, among which skin diseases include acne vulgaris, [18] alopecia areata, [19-22] alopecia, [23] urticaria, [24] vitiligo, [25] pruritus skin disease, [14] and cutaneous neuritis of the lateral thigh [16]. In treating acne vulgaris, Zhang et al. [18] used the electric plum-blossom acupuncture treatment to make a homemade metal head plum-blossom acupuncture with a cannula welded to the acupuncture head, which was connected to the output of the electro-acupuncture instrument through an electrode clip. After wiping the patient's palm with 75% medical alcohol, the patient was asked to hold the metal cannula at the other end of the output electrode, turn on the power switch, use a continuous wave, and rotate the output potentiometer clockwise until the patient felt the appropriate intensity of the electric pulse. Use the plum-blossom acupuncture to gently tap around the acne-dense area of the face and back, as well as the first lateral line of the Governor's pulse and Bladder meridians, the Lung and Large intestinal meridians on the forearm, and the Stomach meridian on the lower extremities. Use the electric plum-blossom acupuncture to tap along the meridians 3-5 times, with each key acupoint tapped for 30 seconds to 1 minute. Electric plum-blossom acupuncture is tapped vertically on

the skin surface at a frequency of 70 to 90 times/min to the extent that the skin is flushed. The control group was treated by applying vitamin A cream. The results showed that the short-term efficacy of the electric plum-blossom acupuncture for treating acne vulgaris was precise, without side effects, and readily accepted by patients.

Eye disorders include oculomotor paralysis, [26] juvenile myopia, [27-32] children amblyopia, [33-35] xerophthalmia, [36] and concomitant strabismus [37]. Among them, juvenile myopia is one of the most commonly treated disorders with electric plum-blossom acupuncture. Li et al. [27] used the plum-blossom acupuncture mode of the acupuncture and massage instrument to apply a pair of electrodes on one side of the corresponding acupoints (Bilateral Neiguan point (PC6)) on the wrist and another pair of electrodes on the related acupoints on the face (in the order of Jinming point (BL1), Chengqi point (ST1), Taiyang point (Ex-HN05), each pair tapped for 5 minutes) and then activated the treatment instrument to tap evenly for 15 minutes, once a day-patient tolerance as the degree. The patients in the drug group were instructed to use eye drops every night before going to bed, with 1-2 drops per use, ten times as a course of treatment. Continuous treatment of 2 courses, five days of rest between the course of treatment. The results showed that the electric plum-blossom acupuncture group was significantly better than the drug group in reducing the lens and ciliary body thickness in myopic eyes under regulation and relieving ciliary muscle spasms ($P < 0.05$). Electric plum-blossom acupuncture treatment effectively improves visual acuity, corrects refractive errors, and delays myopia development in myopic eyes. Electric plum-blossom acupuncture can also be applied to sensory diseases (functional sensory abnormalities, [38] limb numbness [39,40], nasal disorders (paranasal sinusitis [41]), head disorders (headaches [42]), nocturnal enuresis, [43] and gynecological disorders [13].

Contraindications

Electric plum-blossom acupuncture is prohibited for the following diseases:

- A. Acute and acute phases:** Acute infectious diseases or acute inflammation should not be used alone.
- B. Severe lesions:** Severe organic diseases, a high degree of anemia, serious heart disease, and advanced cancer should not be used.
- C. Bleeding-prone diseases:** Diseases that tend to cause bleeding after tapping, such as hemophilia, thrombocytopenic purpura, and allergic purpura, should be banned. Visceral bleeding, such as hemoptysis, vomiting blood, spitting blood, bloody urine, bloody stools, and traumatic hemorrhagic disease should avoid tapping the bleeding site to prevent aggravated bleeding after tapping.
- D. Various kinds of fracture:** Avoid tapping on the affected area when the callus is not formed before or after reduction and fixation.
- E. Pregnancy:** Pregnant women should be used with caution, especially pregnant women with a history of habitual abortion (Table 1).

Table 1: RCT, randomized controlled trial.

Disease Name	Author	Study type	Total sample size(male / female)	Number of experimental group	Age of patients	Intervention of experimental group	Comp-arator	Treatment acupoints or site	The addition method of the electricity	Duration of treatment and frequency	Outcomes	Result and conclusion
Acne vulgaris	Zhang 2014 [18]	RCT	39 (7/32)	19	18-24 years	Electric plum-blossom acupuncture	Vitamin A cream	Site: facial and back acne dense Acupoints: the main points of the first lateral wire of the Governor's pulse, Bladder meridians, the Lung, Large intestinal meridians, and the Stomach meridian	The electric plum-blossom acupuncture treatment was used to make a homemade metal head plum-blossom acupuncture with a cannula welded to the acupuncture head, which was connected to the output of the electro-acupuncture instrument through an electrode clip. After wiping the patient's palm with 75 % medical alcohol, the patient was asked to hold the metal cannula at the other end of the output electrode, turn on the power switch, use a continuous wave, and rotate the output potentiometer clockwise until the patient felt the appropriate intensity of the electric pulse.	Treatment frequency: 2 times / week, 4 weeks a course of treatment	Total effective rate	The total effective rate of the experimental and control groups was 94.8% and 75%, respectively. The differences were statistically significant by statistical treatment (P < 0.05), and the efficacy of the experimental group was better than that of the control group. The short-term effectiveness of the electric plum-blossom acupuncture for treating acne vulgaris was precise, without side effects, and readily accepted by patie
	Yu 1998 [19]	Case series study	50 (17/13)	50	15-56 years	Electric plum-blossom acupuncture combined with body acupuncture	N/A	Acupoints: Baihui point (DU20), Sishencong point (Ex-HN01), Fengchi (GB20), Hegu point (LI3), Taichong point (LR3), Zusanli point (ST36), Sanyinjiao point (SP6)	A homemade electric plum-blossom acupuncture was connected to a G6805-1 therapeutic instrument, and continuous wave therapy was applied.	Duration of treatment: 30 minutes.Treatment frequency: 1 time every other day, 3 times for a course of treatment, 2d rest between coursesDuration of treatment: 10 minutes. Treatment frequency: Once a day or every other day, 14 times for a course of treatment, a total of 3-4 courses of treatment depending on the condition Duration of treatment: more than 30 minutes. Treatment frequency: 1 time / day, 10 times a course of treatment Treatment frequency: 1 time / day, 10 times a course of treatment Treatment frequency: 1 time every other day, 10 times for a course of treatment, 1 week rest between courses	Total effective rate	The total effective rate of electric plum-blossom acupuncture combined with body acupuncture for treating alopecia areata was 100%.

Alopecia areata	Ma 1996 [20]	Case series study	36 (11/25)	36	10-58 years	Electric plum-blossom acupuncture	N/A	Site: hair loss site Acupoints: Fengchi point (GB20)	The transistor therapeutic instrument was selected to connect two output wires, one to the plum-blossom acupuncture and one to the copper rod. Or the two output wires were connected to two plum-blossom acupuncture to make double-headed plum-blossom acupuncture. The therapeutic instrument output peak voltage is 100-120 V, the output dilatational wave frequency is 16-300 times/min, the power supply voltage is 9V (DC) dry battery, and the current is less than five mA.	Total effective rate	The total effective rate of electric plum-blossom acupuncture for treating alopecia areata was 100%.
	Zhang 1982 [21]	Case series study	82 (38/44)	82	5-58 years	Electric plum-blossom acupuncture	N/A	Site: hair loss site, spinal site Acupoints: Fengchi point (GB20)	The transistor therapeutic instrument was selected to connect the two output wires, one to the plum-blossom acupuncture and one to the copper rod. Or the two output wires were connected to two plum-blossom acupuncture to make double-headed plum-blossom acupuncture. The output peak voltage of the therapeutic instrument is 100-120 V, the output dilatational wave frequency is 16-300 times/min, the power supply voltage is 9V (DC) dry battery, and the current is less than five mA.	Total effective rate	The total effective rate of electric plum-blossom acupuncture for treating alopecia areata was 100%.
	Ye 2001 [22]	Case series study	6 (2/4)	6	21-50 years	Electric plum-blossom acupuncture combined with warm acupuncture	N/A	Acupoints: Pishu point (BL20), Shenshu point (BL23), Fengchi point (GB20)	Fix one pole of the output wire of the electro-acupuncture instrument on the needle body of the plum-blossom acupuncture. The other pole was connected to the copper cylinder and then handed to the patient to hold, and then the electro-acupuncture instrument switched on, with the plum-blossom acupuncture in a specific area to tap to treat disease.	N/A	After treatment, all six patients had new hair growth and no hair loss after six months of follow-up.

Alopecia	Yan 1986 [23]	Case series study	28 (19/9)	28	6-47 years	Electric plum-blossom acupuncture	N/A	Site: predominantly diseased areas Acupoints: matching acupoints with symptoms, sideburn bald plus Touwei point (ST8), head vertex bald plus Baihui point (DU20), Qianding point (DU20), Houding point (DU19), pruritus plus Fengchi point (GB20), Fengfu point (DU16), insomnia plus Anmian point, kidney deficiency plus Shenshu point (BL23), Taixi point (KI3)	Not mentioned		Recovery rate	The recovery rate of electric plum-blossom acupuncture in the treatment of alopecia was 25 %. Electric plum-blossom acupuncture has an excellent therapeutic effect on alopecia but is not practical or ineffective for malignant alopecia or seborrheic alopecia.
Urticaria	Mudanjiang Hospital1959 [24]	Case series study	35 (28/7)	35	10-40 years	Electric plum-blossom acupuncture	N/A	Acupoints: Yangchi point (SJ4) of Triple Energizer Meridian, Tianquan point (PC2) -Daling point (PC7) of Pericardium meridian, Chengfu point (BL36) -Chengshan point (BL57) of Bladder meridian, Zhongdu point (LR6) of Liver meridian, Fengchi point (GB20) -Juegu point (GB39) of Gallbladder meridian	Not mentioned	Duration of treatment: 30-60 minutes.	Recovery rate	The recovery rate of electric plum-blossom acupuncture for treating urticaria was 100%. Electric plum-blossom acupuncture was effective in treating urticaria.
Vitiligo	Zheng 2005 [25]	RCT	116(71/45)	58	11-53 years	Electric plum-blossom acupuncture combined with catgut implantation at acupoints under TDP radiation	Apply halometasone cream to the diseased areas	Site: diseased areas	Not mentioned	Experimental group: 1 time / week for 3-6 months. Control group: adults 2 times / day for 3-6 months; minors 1 time / day for less than 3 months	Total effective rate	The short-term total effective rate was 98.3% in the experimental group and 74.1% in the control group, with a significant difference between the two groups ($P \leq 0.05$). Conclusion Electro plum-blossom acupuncture plus catgut implantation at acupoints has a better therapeutic effect on vitiligo with no adverse effects.
Pruritus skin disease	Wang 2005 [14]	Case series study	100	100	Not mentioned	Electric plum-blossom acupuncture	N/A	Site: both sides of the spine, skin after lesion	Fix one pole of the output wire of the electro-acupuncture instrument on the needle body of the plum-blossom acupuncture, and the other pole was connected to the copper cylinder and then handed to the patient to hold, and then the electro-acupuncture instrument switched on.	Treatment frequency: 1 time / day	Total effective rate	The total effective rate of electric plum-blossom acupuncture for treating pruritus skin disease was 98.3%. Electric plum-blossom acupuncture was effective in treating pruritus skin disease.

Cutaneous neuritis of the lateral thigh	Zhang 1985 [16]	Case report	1	1	38 years	Electric plum-blossom acupuncture combined with moxibustion	N/A	Site: diseased areas Acupoints: Yanglingquan point (GB34)	One of the two output wires of the electro-acupuncture instrument was connected to the plum-blossom acupuncture, and the other was connected to the electrode at the damaged limb's Yanglingquan point (GB34). The affected area and needles were sterilized, and the electro-acupuncture instrument was activated, producing dilatational wave frequencies of 16-300 times/min. The frequency of longitudinal tapping with plum-blossom acupuncture on the affected part from top to bottom is generally 80-120 times/min.	Treatment frequency: 1 time / day, 5 times a course of treatment	Total effective rate	The total effective rate of electric plum-blossom acupuncture for treating cutaneous neuritis of the lateral thigh was 100%. Electric plum-blossom acupuncture was effective in treating cutaneous neuritis of the lateral thigh.
Oculomotor paralysis	Shang 2021 [26]	non-RCT	70(43/27)	40	50-64 years	Electric plum-blossom acupuncture combined with acupuncture	Acupuncture	Site: scalp needle visual area Acupoints: Fengchi point (GB20), Baihui point (DU20), Jinning point (BL1), Cuanzhu point (BL2), Tongziliao point (GB1), Taiyang point (Ex-HN05), Qiuhou point (Ex-HN07), Sibai point (ST2), Sizhukong point (SJ23), Yangbai point (GB14) to Yuyao point (Ex-HN04), Zhengguang point (Ex-HN18)	The electric plum-blossom acupuncture was used as an efficient electro-acupuncture instrument. One of the two output wires was connected to the electric plum-blossom acupuncture, and the other was connected to the copper rod of the wire held by the patient's hand, turned on the power, adjusted the continuous output wave frequency 18-100 times/min, voltage 9V, current 5mA.	Treatment frequency: 1 time / day, 20 times a course of treatment	Total effective rate, symptoms score, eye fissure height, diplopia distance	The effective rate was 92.5 % in the experimental group and 70.0 % in the control group (P<0.05). After treatment, the symptom score and diplopia distance in the experimental group were all lower than that of the control group (P<0.05), and the eye fissure height was higher than that of the control group (P<0.05). Electric plum-blossom acupuncture combined with acupuncture is simple, safe, and easy to operate. It is one of the safest and most effective means to treat oculomotor paralysis and has broad prospects for clinical application.

	Li 2007 [27]	RCT	160(80/80)	80	11-13 years	Electric plum-blossom acupuncture	Tropicamide eye drops	Acupoints: Jinning point (BL1), Chengqi point (ST1), Taiyang point (Ex-HN05), Neiguan point (PC6)	Selected the plum-blossom acupuncture mode of the acupuncture and massage instrument to apply a pair of electrodes on one side of the corresponding acupoints (Bilateral Neiguan point (PC6)) on the wrist and another pair of electrodes on the related acupoints on the face (in the order of Jinning point (BL1), Chengqi point (ST1), Taiyang point (Ex-HN05), each pair tapped for 5 minutes) and then activated the treatment instrument to tap.	Duration of treatment: 15 minutes. Treatment frequency: 1 time / day, 10 times a course of treatment, 2 courses of treatment, with a 5-day break between courses	Total effective rate, vision, diopter, corneal refractive power, ocular-axial length, lens and ciliary thickness	The total effective rate was 80.0 % in the experimental group and 58.1 % in the control group. The two groups had a significant difference (P<0.05). The experimental group was significantly better than the control group in reducing the thickness of the lens and ciliary and relieving ciliary muscle spasm under myopia (P<0.05). Both groups did not affect corneal refractive power and ocular-axial length. Electric plum-blossom acupuncture stimulation improves visual acuity, corrects ametropia, and delays myopia development.
	Zhang 2021 [28]	RCT	68(36/32)	34	5-12 years	Electric plum-blossom acupuncture combined with general prevention and control treatment	General prevention and control treatment	Acupoints: Yintang point (Ex-HN03), Cuanzhu point (BL2), Sizhukong point (SJ23), Yuyao point (Ex-HN04), Taiyang point (Ex-HN05), Sibai point (ST2), Neiguan point (PC6), Hegu point (LI4), Fengchi point (GB20), Dazhui point (DU14), Baihui point (DU20)	Selecting an acupoint nerve stimulator with one output electrode connected to plum-blossom acupuncture and the other end was held in the palm of the patient. The output pulse continuous wave frequency was 60HZ, the power supply voltage was 9 volts DC dry battery, and the current intensity was less than five mA.	Duration of treatment: 20 minutes. Treatment frequency: 2 times / week, 2-4 days apart, for 12 weeks of treatment	Vision, diopter, corneal refractive power, ocular-axial length,	After treatment, the experimental group's visual was significantly improved, and the difference was statistically significant. (P < 0.01). Electric plum-blossom acupuncture can improve the vision and diopter of patients with mild myopia, which is conducive to preventing and controlling juvenile myopia. During the experimental study, there were no adverse reactions or adverse events to electric plum-blossom acupuncture. It is safe, reliable, and easy to promote.
Juvenile myopia												

	Wang 2005 [29]	RCT	120 (60/60)	60	11-13 years	Electric plum-blossom acupuncture	Tropicamide eye drops	Acupoints: Zhengguang point (Ex-HN18), Fengchi point (GB20), Neiguan point (PC6), Dazhui point (DU14)	Not mentioned	Duration of treatment: 15 minutes. Treatment frequency: 1 time / day, 10 times a course of treatment, 2 courses of treatment, with a 5-day break between courses Treatment frequency: 1 time every other day, 15 times for a course of treatment Duration of treatment: 15 minutes. Treatment frequency: 1 time / day, 10 times a course of treatment Treatment frequency: 1 time every other day, 15 times for a course of treatment	Vision , diopter, corneal refractive power, ocular-axial length, lens and ciliary thickness	Electric plum-blossom acupuncture can correct ametropia caused by regulating spasms, and can significantly improve the vision of myopia patients. The curative effect is better than tropicamide eye drops, and there are no side effects. Patients easily accept and master the method.
	Plum-blossom acupuncture studio1975 [30]	Case series study	580 (256/324)	580	6-20 years	Electric plum-blossom acupuncture	N/A	Acupoints: Zhengguang point (Ex-HN18), Fengchi point (GB20), Neiguan point (PC6), Dazhui point (DU14)	Not mentioned		Total effective rate	Electric plum-blossom acupuncture effectively treats juvenile myopia and is more productive than plum-blossom acupuncture.
	Zhong 1989 [31]	Case series study	1158 (480/678)	1158	6-20 years	Electric plum-blossom acupuncture	N/A	Acupoints: Zhengguang point (Ex-HN18), Fengchi point (GB20), Neiguan point (PC6), Dazhui point (DU14)	Not mentioned		Total effective rate	Electric plum-blossom acupuncture is effective in treating juvenile myopia.
	Yang 1990 [32]	Case series study	49 (29/20)	49	9-17 years	Electric plum-blossom acupuncture	N/A	Acupoints: Sibai point (ST2), Jinming point (BL1), Cuanzhu point (BL2)	Two output wires of the electro-acupuncture instrument were connected to the plum-blossom acupuncture, and the other was connected to the metal ring and looped the metal ring on the ring finger.		Total effective rate	The total effective rate was 64.9 % in the electric plum-blossom acupuncture treatment. Electric plum-blossom acupuncture is effective in treating juvenile myopia.

	Wang 2012 [33]	RCT	38 (16/22)	20	4-12 years	Electric plum-blossom acupuncture combined with comprehensive therapy of Western medicine	Comprehensive therapy of Western medicine	Acupoints: Jinning point (BL1), Fengchi point (GB20), Dazhui point (DU14)	One of the two output wires of the electro-acupuncture instrument was connected to the plum-blossom acupuncture, and the other end was held in the patient's palm. Tapping at a frequency of 90-100 times/min at 1-1.5 cm diameter on the body surface of the acupuncture point, with a wrist flick and 50 even strokes per point.		Examinations of P-VEP, vision correction	In the experimental group, the instant effect and P100 wave peak latency were significantly shortened ($P<0.05$), but amplitude had no significant difference compared with the control group. The results of the visual acuity examination showed that in the experimental group, the visual acuity of 32 eyes among 36 eyes (88.9%), and in the control group, that of 24 among 33 eyes (72.2%) increased by two or more wires in the visual chart. According to the analysis of age, degree, and types of amblyopia and curative effect, the total effective rate was higher in the experimental group than in the control group. The tap therapy of an electric plum-blossom needle can shorten P-VEP's P100 wave peak latency in amblyopia children and improve their visual acuity. It has a bright application prospect in the clinic.
Children amblyopia												
	Hu 2008 [34]	RCT	60 (31/29)	30	4-12 years	Electric plum-blossom acupuncture	Comprehensive therapy	Acupoints: Zhengguang point (Ex-HN18), Fengchi point (GB20), Neiguan point (PC6), Dazhui point (DU14)	Select the electro-acupuncture instrument and connect one of the output wires to the plum-blossom acupuncture and the other to the copper rod. Let the patient hold the copper rod attached to the wire with one hand, output continuous wave frequency 60HZ, current intensity less than five mA, to be tolerated by the patient.	Treatment frequency: 1 time every other day, 30 times for a course of treatment	Total effective rate	The total effective rate was 70.37 % in the experimental group and 47.17 % in the control group. The two groups had a significant difference ($P<0.05$). No adverse reactions were found during the test and after treatment in both groups, indicating no adverse reactions to the therapy with electric plum-blossom acupuncture. Electric plum-blossom acupuncture for treating amblyopia in children has significantly shortened the onset of action. It has a definite efficacy, which improves visual acuity and shortens the course of treatment.

	Wu 1994 [35]	non-RCT	112 (53/59)	56	3-12 years	Electric plum-blossom acupuncture combined with comprehensive therapy of Western medicine	Comprehensive therapy of Western medicine	Acupoints: Zhengguang point (Ex-HN18), Fengchi point (GB20), Neiguan point (PC6), Dazhui point (DU14)	Not mentioned	Treatment frequency: 1 time every other day, 15 times for a course of treatment	Total effective rate	The total effective rate was 51.7 % in the experimental group and 33.9 % in the control group. The experimental group's effective rate was significantly better than the control group's (P<0.05). The electric plum-blossom acupuncture technique for treating children's amblyopia is safe, reliable, and worthy of clinical promotion.
Xerophthalmia	Zang 2014 [36]	RCT	50 (21/29)	25	45-63 years	Electric plum-blossom acupuncture	0.1% sodium hyaluronate eye drops	Acupoints: Sibai point (ST2), Jingming point (BL1), Cuanzhu point (BL2), Taiyang point (Ex-HN5), Fengchi point (GB20), Baihui point (DU20) and Neiguan point (PC6)	One of the two output wires of the electro-acupuncture instrument was connected to the plum-blossom acupuncture, and the other was connected to the copper rod. The patient was asked to sit and hold the copper rod in one hand, output dilatational wave frequency 40-60HZ, to be tolerated by the patient.	Treatment frequency: 5 time/week, 4 weeks a course of treatment	Clinical symptom scores before and after 1 course of observation, the change of tear secretion (SIT), the breakup time of tear film (BUT)	The experimental and control groups before and after treatment clinical curative effects have significant differences (P<0.05). The total effective rate of the two groups were 88% and 60%, respectively, comparing the two groups have significant differences (P<0.05), the clinical symptom scores, SIT, and BUT of the two groups had significant differences (P<0.05), before and after the treatment; and after treatment, there was a substantial difference between the treatment group and the control group (P<0.05), treatment group curative effect was better than the control group. Electric plum-blossom acupuncture and 0.1% sodium hyaluronate eye drops in dry eyes are both clinically effective, but plum-blossom acupuncture was more prominent in treating xerophthalmia clinical effect.
Concomitant strabismus	Zhong 1989 [37]	Case series study	143 (70/73)	143	4-20 years	Electric plum-blossom acupuncture	N/A	Acupoints: Fengchi point (GB20), Shenshu point (BL23), Zhengguang point (Ex-HN18)	Not mentioned	Treatment frequency: 1 time/day or 1 time every other day, 10-15 times for a course of treatment Duration of treatment: 5-10 minutes. Treatment frequency: 1 time/day or 1 time every other day, 5-10 or 10-20 times for a course of treatment Treatment frequency: 1 time/day, 7 times for a course of treatment	Total effective rate	The total effective rate of electric plum-blossom acupuncture for concomitant strabismus was 98.9%. Electric plum-blossom acupuncture was influential in the treatment of concomitant strabismus.

Functional sensory abnormalities	Zhang 1982 [38]	Case series study	53 (27/26)	53	12-60 years	Electric plum-blossom acupuncture	N/A	Site: abnormal sensory areas	The use of a homemade electric plum-blossom acupuncture treatment instrument, the output induction current, and the output voltage 0 ~ 20V adjustable. During the treatment process, the operator held the electric plum-blossom acupuncture connected to the central pole, which acted on the abnormal sensory areas, and the negative pole was usually held in the patient's hand or placed in other parts.		Total effective rate	The total effective rate of electric plum-blossom acupuncture for treating functional sensory abnormalities was 100%. Electric plum-blossom acupuncture was influential in the treatment of functional sensory abnormalities.
	Zhang 2003 [39]	Case series study	48 (21/27)	48	22-76 years	Electric plum-blossom acupuncture combined with Chinese medicine hot compress	N/A	Site: lesion site and the meridians	Prepared two pairs of plum-blossom acupunctures, connected the positive and negative poles of the electro-acupuncture instrument to the needle clusters of the two pairs of plum-blossom acupunctures, one pair of plum-blossom acupunctures placed at the heaviest numbness, the other pair of tapping through the meridians.		Total effective rate	The total effective rate of electric plum-blossom acupuncture for treating limb numbness was 100%. Electric plum-blossom acupuncture combined with Chinese medicine hot compress was influential in treating functional sensory abnormalities.
Limb numbness												
	Jiang 1981 [40]	Case series study	40 (N/A)	40	22-76 years	Electric plum-blossom acupuncture	N/A	Site: lesion site Acupoints: Waiguan point (SJ5), Quchi point (LI11), Daling point (PC7), Yangchi point (SJ4), Houxi point (SI3), Shixuan point (Ex-UE11), Zusanli point (ST36), Yangling point (GB34), Xuanzhong point (GB39), Sanyingjiao point (SP6), Kunlun point (BL60), Jiexi point (ST41), Taichong point (LR3), Baxie point (Ex-UE9)	Held the positive pole of the output lead of the transistor therapeutic instrument in the patient's hand. Wrapped the negative pole lead around the end of the plum-blossom acupuncture, turned on the instrument switch, rotated it to the appropriate amount, and applied the wave switch to the dilatational wave.	Treatment frequency: 1 time every other day, 10 times for a course of treatment	Total effective rate	The total effective rate of electric plum-blossom acupuncture for treating limb numbness was 92.5%. Electric plum-blossom acupuncture was influential in the treatment of functional sensory abnormalities.
	Qin 1994 [41]	Case series study	85 (54/31)	85	19-57 years	Electric plum-blossom acupuncture	N/A	Site: infraorbital triangle (1 inch from the outer corner of the eye and the nasal wing as an oblique wire, the midwire of the nose, and the parallel wire of the infraorbital area, the three wires were connected to form a corresponding triangle, this was zone 1). Yintang point (DU29) and its surroundings were zone 2, the upper edge of the eyebrow and the forehead between the hairwire was zone 3	One of the two output wires of the electro-acupuncture instrument was connected to the plum-blossom acupuncture, and the other was connected to the copper rod. The patient held the copper rod in one hand.	Treatment frequency: 1 time every other day, 7 times for a course of treatment	Total effective rate	The total effective rate of electric plum-blossom acupuncture for treating paranasal sinusitis was 100%. Electric plum-blossom acupuncture was influential in the treatment of paranasal sinusitis.

Paranasal sinusitis	Zhang 2000 [42]	Case series study	158 (45/113)	158	15-62 years	Electric plum-blossom acupuncture	N/A	Site: Exogenous type: both sides of C1~C4, both sides of T3~T5, painful areas of the head, hypothenar and thenar eminence, elbow fossa and anterior chest and hypochondriac area. Hyperactivity of liver yang type: C1~C7 on both sides, T9~T11 on both sides, and S2~S4 on both sides. Kidney deficiency type: both sides of C1~C7, both sides of L2~L4, and both sides of S1~S2. Dual deficiency of qi and blood type: both sides of T5~T12, both sides of L2~L5. Acupoints: Exogenous type: Fengchi point (GB20), Taiyang point (Ex-HN5), Dazhui point (DU14). Hyperactivity of liver yang type: Quchi point (LI11), Neiguan point (PC6), Sanyingjiao point (SP6), Taixi point (KI8), Baihui point (DU20), Fengchi point (GB20), Taiyang point (Ex-HN5). Kidney deficiency type: Baihui point (DU20), Fengchi point (GB20), Taiyang point (Ex-HN5), Neiguan point (PC6), Qihai point (RN6). Dual deficiency of qi and blood type: Xinshu point (BL15), Pishu point (BL20), Ganshu point (BL18).	One of the two output wires of the electro-acupuncture instrument was connected to the plum-blossom acupuncture, and the other to the copper rod held in the patient's hand. Turned on the instrument and adjusted the output continuous wave, frequency 16~300 times/min, output peak voltage 100~120V, currently less than 5mA, the flow rate varies from person to person, to be tolerated by the patient.	Treatment frequency: 1 time/day or 1 time every other day, 10 times for a course of treatment	Total effective rate	The total effective rate of electric plum-blossom acupuncture for treating headaches was 100%. Electric plum-blossom acupuncture was influential in the treatment of paranasal sinusitis. Electric plum-blossom acupuncture for headaches was less painful, quicker, shorter, and more effective in relieving pain.
Headaches												
Nocturnal enuresis	Mudanjiang Central Hospital 1959 [43]	Case series study	18 (12/6)	18	9-16 years	Electric plum-blossom acupuncture combined with moxibustion	N/A	Acupoints: Shangliao point (BL31), Ciliao point (BL32), Zhongliao point (BL33), Xialiao point (BL34), Mingmen point (DU4), Yaoyangguan point (DU3), Shenshu point (BL23), Qihai point (RN6), Guanyuan point (RN12), Zhongji point (RN3).	Not mentioned	Duration of treatment: 20 minutes. Treatment frequency: 1 time/day or 1 time every other day	Total effective rate	The total effective rate of electric plum-blossom acupuncture for nocturnal enuresis was 100%, with a cure rate of up to 74% and 26% reduction in nocturnal enuresis. Electric plum-blossom acupuncture was influential in the treatment of nocturnal enuresis.
Gynecological disorders	Shen 1959 [13]	Case series study	13 (0/13)	13	Not mentioned	Electric plum-blossom acupuncture	N/A	Site: Dysmenorrhea: lumbosacral vertebrae, lower abdomen, groin. Amenorrhea: second lumbar-sacral vertebra, inguinal region, frontal region. Chronic adnexitis: fifth lumbar-sacral vertebra, groin. Subacute endometritis: lumbosacral vertebrae, lower abdomen, groin. Postoperative pelvic adhesions: third lumbar-tail vertebra, public fossa.	One of the two output wires of the electro-acupuncture instrument was connected to the plum-blossom acupuncture, and the patient held the other.	Treatment frequency: 1 time/day, 5-10 times for a course of treatment	Total effective rate	The total effective rate of electric plum-blossom acupuncture for treating gynecological disorders was 100%. Electric plum-blossom acupuncture was influential in the treatment of gynecological disorders.

F. Various skin diseases: swelling, sores, should avoid tapping on the affected area to prevent spreading the disease [44].

Adverse Events

Electric plum-blossom acupuncture current has been proven to be a safe and effective method of treating numerous ailments. Adverse Events (AEs) have been reported rarely, and most AEs are mild to moderate. The most common AEs associated with electric plum-blossom acupuncture are bleeding and hematoma caused by tapping. Other possible AEs include fainting during acupuncture, skin infection, unbearable tingling, nausea, vomiting, palpitation, dizziness, headache, abscess formation, insomnia, and hyperpigmentation. We classify these AEs into preventable adverse events and non-preventable adverse events (Table 2).

Table 2: Classification of adverse events.

Preventable Adverse Events	Non-Preventable Adverse Events
Bleeding and hematoma	Unbearable tingling
Fainting during acupuncture	Nausea
Skin infection	Vomiting
Abscess formation	Palpitation
	Dizziness
	Headache
	Insomnia
	Hyperpigmentation

Adverse Events Control Measures

Preventing or avoiding preventable adverse events through some previous measures is possible. The cause of bleeding and hematoma was bleeding caused by stabbing a large blood vessel. It is necessary to avoid heavy stimulation manipulation at the treatment site with blood vessels and use sterile cotton balls to press the treatment site promptly after tapping. It has been shown that prolonging the pressing time can reduce bleeding [45]. A small amount of subcutaneous bleeding or slight local bruising, generally not treated, can subside independently. The bruised area can be treated with cold compresses if swelling and pain are severe, and the injured area is more extensive. Then the patient is instructed to apply hot compresses 24-48 hours later to promote local hematoma dissipation and absorption.

The main reason for skin infection is lax sterilization. Doctors should disinfect their hands and treatment sites and use disposable needles to prevent skin infections. The treatment site should avoid the use of heavy stimulation manipulation. If local skin infections related to this study occur, treatment must be given according to the condition. Symptoms that are mild, tolerable, and do not interfere with daily study or life do not require treatment. If the pain is obvious and there is a slight inflammatory reaction, which affects daily life and research, suspend the treatment and rest, reduce the activity, do not squeeze the affected area, apply anti-inflammatory and analgesic drugs properly, and continue treatment after the

symptoms disappear. Treatment should be stopped immediately if local ulceration or general discomfort occurs due to the infection, and symptomatic and supportive therapy such as pus drainage, anti-inflammatory and analgesic should be given.

Summary

To summarize, some diseases have been treated very effectively with electric plum-blossom acupuncture therapy, which combines skin stimulation, meridians, and acupoints. This article reviews and summarizes the electric plum-blossom acupuncture treatment mechanism, the method of adding electricity, clinical treatment, indications, contraindications, and adverse event reports, offering insight for future research. This article suggested that electric plum-blossom acupuncture activates nerve cells, promotes neuronal function, improves neurological function, produces analgesic effects, increases local blood circulation, eliminates edema rapidly, improves local immunity, and strengthens muscle strength and endurance by contracting muscle fibres. In this article, the method of adding electricity to the electric plum-blossom acupuncture is divided into three stages: beginning in the 1950s, developing in the 1980s, and maturing in the 21st century. Various conditions can be treated with electric plum-blossom acupuncture, including skin, eye, sensory, nasal, head, nocturnal enuresis, gynecological, etc. However, these pieces of literature are all Chinese, and most are case series studies. Therefore, more high-quality randomized controlled trials are needed to verify the effectiveness of electric plum blossom needles in treating diseases. The plum-blossom electric acupuncture is part of the traditional Chinese medicine approach. Among its characteristics is the ability to provide customized treatment. For example, the choice of acupoints, the size of stimulation, the frequency of treatment, etc., all need us to formulate specific treatment plans according to the patient's condition. Plum-blossom acupuncture therapy has received less attention recently, resulting in a limited application for varied conditions. Even in China, awareness of this treatment method could be higher. To increase its effectiveness, we should promote plum-blossom acupuncture therapy through more literature and broaden its application to various ailments, thus providing new treatment ideas and methods.

Authors' Contributions

All authors contributed to the study's conception and design. The research and the analysis of the articles found in the China National Knowledge Infrastructure (CNKI) and other databases were performed by WY and YY. WY wrote the first draft of the manuscript in consultation with LK. TY supervised the project. All authors read and approved the final manuscript.

Availability of Data and Materials

The datasets during and analysed during the current study available from the corresponding author on reasonable request.

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