

Acupuncture Therapy: An Emerging Adjunct in Prosthodontic Care

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Abstract

Acupuncture is among the best known system of Traditional Chinese Medicine. Over its 3000 years of development, a wealth of experience has accumulated in the practice of acupuncture, attesting to the wide range of diseases and conditions that can be effectively treated with this approach. Its benefits are now widely acknowledged all over the world. This article emphasizes the scientific background of acupuncture in general and illustrates its use as an adjunct in Prosthodontics based on evidence based research.

Keywords: Acupuncture, Acupoints; Meridians; Traditional Chinese Medicine

Introduction

Acupuncture is a tried and tested system of complementary and alternative therapy, which has been used in China and other eastern cultures for thousands of years to restore, promote and maintain good health. It has potential in supplementing conventional treatment procedures by its diverse applicability outreach. Whilst the recognition and application of acupuncture in the medical field has made much progress over the last decade, its development in the dental field is currently in its infancy stage. A great deal of skepticism in the professional community is that acupuncture is a complicated technique involving a substantial knowledge of ancient Chinese philosophy and whose action is largely a placebo effect [1,2]. However, in recent years' acupuncture is gaining momentum and adherents as a valid intervention in palliative dentistry owing to published results of its efficacy [3].

The aim of this article is to discuss and review methodologically the efficacy of acupuncture, its imputed mechanism of action and scientific evidence for application in the field of prosthodontics.

Definition

Acupuncture, or needle puncture, is a European term coined by Willem Ten Rhyne, a Dutch physician. The term "acupuncture" consists of two words from the Latin (Acus: needle and Puncture: insertion). The Chinese describe acupuncture by a graphic character 'Chen', which literally means 'to prick with a needle'. The Traditional Chinese Medicine (TCM) Practitioners Act in Singapore

defines acupuncture as "the stimulation of a certain points on or near the surface of the human body through any technique of point stimulation (with or without the insertion of needles), including the use of electrical, magnetic, light, sound energy, cupping, moxibustion to normalize physiological functions or to treat ailments or conditions of the human body." This form of treatment involves the use of steel, silver or gold needles that are inserted into specific acupuncture points [4]. The term "acupuncture" can also be used in its broad sense to include [5-10]:

1) Traditional body acupuncture (Body needling); 2) Microsystems acupuncture such as ear acupuncture (Auricular), face, hand & scalp acupuncture; 3) Electro-acupuncture (electric acupuncture); 4) Trigger point acupuncture; 5) Laser treatment (photo treatment); 6) Moxibustion; 7) Acupressure (the application of pressure at specific sites); 8) Okibari - Japanese style

Historical review: The history of Acupuncture in TCM can be traced back to the Warring States and the Qin and Han Dynasties more than 3000 years ago [11,12]. The ancient written record of acupuncture is found in the Huangdi Neijing (The Yellow Emperor's Inner Canon), dated approximately 200 BC [13]. Acupuncture originated in China and soon spread to Japan, the Korean peninsula in 6th century and to Vietnam and elsewhere in Asia in 8th and 10th century. Hieroglyphs and pictographs have been found dating from the Shang Dynasty {1600-1100 BCE (Before Common Era)}, which suggest that acupuncture was practiced along with Moxibustion [6,14-16]. The story of James Reston, a New York Times editor, whose post-appendectomy pain was relieved by acupuncture and the visit of United States President Richard Nixon to China in 1971 brought acupuncture into the limelight

and created much interest in the Western medical field. In 1979, the World Health Organization (WHO) endorsed the use of acupuncture to treat 43 symptoms. In 1996, this was extended to 64 indications. In the Geneva WHO 2003 report, pain in dentistry (including dental pain and temporomandibular dysfunction), facial pain and postoperative pain were listed among the conditions for which acupuncture has been proven through controlled trials, to be an effective treatment [17].

Concept of Acupuncture in Traditional Chinese Medicine: The theoretical background of acupuncture therapy is based on the metaphysical concepts of qi (vital life force) and yin-yang (dark-light) balance. Traditional Chinese medicine believes in the concept of holism, whereby the human body is seen as an “organic whole” and all the constituent parts are inter-connected through thousands of nerve points that are located along meridians or power lines inside the body [17]. There are 14 meridians in the body, on which 361 points specified for acupuncture have been identified [18,19]. These power-lines carry energy or qi which is distributed evenly in cases of health body. However, in sickness or disease, an obstruction at a particular point affects the rest of the body. Acupuncture therapy involves the stimulation of certain points along meridians to clean out the obstruction and redirect energy into the affected parts. This allows the free flow of qi and maintenance of yin-yang and qi-blood equilibrium [11].

Scientific Basis of Acupuncture: Around 70-80% of these acupuncture points are similar to the trigger points and most of them points are also similar to muscular motor points [3,20-24]. Acupuncture points have low electrical resistance and can be regarded as energy concentrating points, comparable to electric batteries in which, up to a certain extent, physical energy is stored (Leonhardt, 1980). Acupuncture prevents and treats diseases by inserting very fine needles into the skin specifically at the anatomic points of the body to stimulate the nervous system and cause the release of neurochemical messenger molecules. The resulting biochemical changes influence the body’s homeostatic mechanisms, reduce sensitivity to pain and stress, as well as promote relaxation, physical and emotional well-being [1].

It is well-known that any painful stimulation activates A- δ -fibers and C-fibers in the peripheral nervous system. These fibers terminate at the second layer of the back horn from which the pain sensation is transmitted to the cortex via interneuron and pain is experienced [1,25]. Insertion of a needle in an acupuncture point creates a small inflammatory process with the release neurotransmitters such as bradykinin, histamine, etc. and stimulation of A- δ -fibers located in the skin and muscle. Impulses are sent to the spinal cord and activation of the midbrain and pituitary-hypothalamus takes place. This is followed by release of enkephalin, beta-endorphin, dynorphin, serotonin, and noradrenalin causing pre and post-synaptic inhibition of pain transmission. This accounts

for the analgesic effect of acupuncture in most cases. From the second layer of the back horn, the A- δ -fiber continues to the fifth layer of the back horn, cross over to the opposite side and ascend via the spin thalamic tract to the mid brain where the raphe magnus nucleus is stimulated. Raphe magnus nucleus is the main producer of serotonin on the brain and is believed to play a key role in acupuncture’s mode of action. Serotonin is a pro-drug for endorphin, which probably accounts for the central (extra-segmental) effect of acupuncture. Also, serotonin is a pro-drug for ACTH (Adrenocorticotrophic Hormone), which probably via the pituitary gland accounts for the increase of cortisol, and improves the immune system. Further, serotonin has a direct effect on the cortex and it is likely that the beneficial effect of acupuncture on stress and anxiety is because of this direct effect [26-29].

Application of Acupuncture in Prosthodontics: Acupuncture has been widely used in dentistry. There are reports of randomized controlled trials on the analgesic effect of acupuncture for post-operative pain from various dental procedures, including tooth extraction, pulp digitalization and acute apical periodontitis. Further clinical applications may include treatment of facial pain, trigeminal neuralgias, muscle spasm, chronic stress headache, migraine, rhinitis, sinusitis, altered sensations in the mouth and dental anxiety. In Prosthodontics, acupuncture may be used as an adjunct in relieving gagging, temporomandibular disorders and xerostomia.

Gagging

Gag reflex is a normal protective, physiological mechanism which occurs to prevent foreign objects or noxious material from entering the pharynx, larynx or trachea. Its causes can be somatic, brought about by stimulating certain trigger areas (palatoglossal and palatopharyngeal folds, base of the tongue, palate, uvula and posterior pharyngeal wall in the oral cavity), or psychogenic, which is induced by thought stimulus (fear, stress, phobia and sights and sounds of clinical dentistry) modulated by higher brain centers [17]. Iatrogenic factors like manipulations of the oral tissues, over loaded impression trays, overextended posterior borders in dentures, restricted tongue space, poor retention, increased vertical dimensions are also capable of inducing the gag reflex in patients [30-32].

Hyperactive gag reflex in patients can be disruptive to prosthodontic treatment. It may be a barrier to successful impression making. Also, overall patient care may be compromised as it may prevent the provision of treatment and the wearing of prostheses. Anecdotal evidence suggests that up to 87% of dentists are faced by patients who experience this problem at least once a month [33]. Acupuncture therapy can be regarded as a supplement to orthodox treatment where other treatment modalities may be limited or ineffective.

The antiemetic effect of acupuncture can be attributed to an increase in circulating β -endorphin and acceleration in the synthesis of serotonin and nor adrenaline [1,11]. Additionally, it has been suggested that acupuncture can desensitize chemoreceptor trigger zones in the brain via neuro chemical substances and, thus, have an anti-emetic effect [34]. Various points have been used to control gag reflex in dentistry such as CV-24, PC6, LI4 and Anti-gagging point on ear [18,34-38].

CV-24 (Chengjiang) is located in horizontal mentolabial groove approximately midway between chin and lower lip (Figure 1). PC6 (Neiguan point) is a concave area, located on the palmer side of the forearm - two inches above the transverse crease of the wrist (Figure 2), belongs to the pericardium meridian and is approximately one horizontal finger width [11,17,30]. LI4 (Hegupoint) is a concave area between first and second metacarpal bones (Figure 3) [33]. Anti-gagging point (Figure 4) is located on the ear and corresponds with the skin of the external acoustic meatus (innervated by the auricular branch of the vagus nerve) and that adjacent to the auricle (innervated by the auriculotemporal branch of the mandibular division of the trigeminal nerve). Both the vagus and trigeminal nerves have branches responsible for the sensory and motor function of the larynx, pharynx and palatal region. It can be postulated that stimulation of the auricular acupuncture point may inhibit the muscular activity in gag reflex [30].



Figure 1: CV-24(Chengjiang point).



Figure 2: PC-6(Neiguan point).



Figure 3: LI4(Hegupoint).

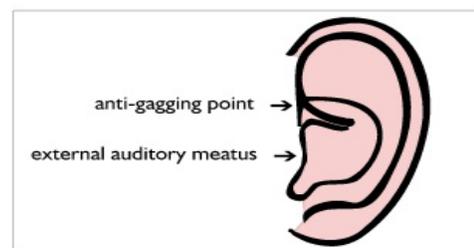


Figure 4: Anti-gagging point on ear.

Various authors have documented that acupuncture therapy proves to be a valuable aid in controlling gagging. In a study conducted by Lu et al. (2000) [36] patients were randomly allocated to either acupuncture at PC6 or acupressure at the same point. In the acupuncture group, needles were inserted in PC6 and in a nearby non-acupuncture point, and stimulated electrically. Both techniques resulted in control of the gag reflex, with a greater effect being found in the acupuncture group. An audit of a case series by Rosted et al. (2006) [33] has shown that acupuncture of point CV-24 just before taking an upper alginate impression had a substantial controlling effect on the gag reflex. Sari et al. (2010) [37] stated that both acupuncture points CV-24 and PC6 were effective in controlling gag reflex during maxillary alginate impression. In an uncontrolled study by Fiske and Dickinson (2001) [34] on ear acupuncture in ten people, it was found that stimulation of the anti-gagging point resulted in control of severe gag reflex of 10 patients sufficiently well to allow dental treatment to be carried out. Studies have asserted that acupuncture is a safe, inexpensive, quick, and relatively noninvasive technique to control the gag reflex in patients. The patient is unaffected by the technique, does not require an escort and can return to normal daily activities after treatment [3].

Temporomandibular Disorders (TMDs): Temporomandibular disorders is a term which includes a group of conditions that affect the temporomandibular joint, the muscles of mastication, and the associated head and neck musculoskeletal structures [39]. Occlusal interference, systemic musculoskeletal disorders, myofascial pain and dysfunction, emotional disturbances and general

ill health seem to play a role [40] Under most circumstances, the treatment of TMD-related pain, especially pain originating primarily from the muscle, begins with conservative, noninvasive methods which include medication, patient education, dietary modifications, and occlusal splints and/or occlusal therapy [41] However no method has been reported with fully convincing results [42-44] While acupuncture therapy may not be useful in eliminating the cause of TMD if it is due to structural anomalies like disc displacement and degenerative changes, it may help to relieve the pain and discomfort associated with the conditions, especially if they are muscular in origin. It has been documented that acupuncture can help in muscle relaxation and reduce muscle spasms [17]. The effects of acupuncture on temporomandibular disorder may be associated with its ability decrease muscle activity at rest, shown by reduced electromyography activity [45]

The basic procedure employs inserting the needles at the acupoint and achieving the de qi sensation (needling sensation such as tingling, soreness, heaviness). The needle should be left in the acupoints for 30 minute in each treatment session. The patient should return for maintenance treatments once every 3 months, until the remission of symptoms. The treatment should be conducted once a week, 30 minutes each time, over six treatment sessions. Patients should then be followed up every 3 months until the symptoms are relieved Local acupoints on the head and neck recommended for treatment are: ST-6, ST-7, SI-18, GV- 20, GB-20, BL-10 and Distant point LI-4 [41,46,47].

ST-6 is on the stomach meridian, and it is located near the mandible angle and one middle-finger's breadth from the angle of the mandible (Figure 5). When the mouth is wide open, a depression can be felt on the acupoint, and when teeth are clenched, a bounce from masseter muscle can be felt. Insertion of the needle at the acupoint penetrates masseters muscle to stimulate the analgesic effect to the fatigued muscle.

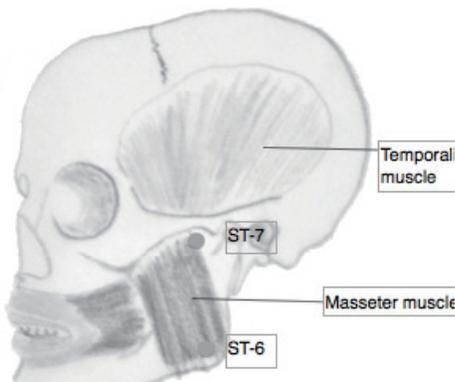


Figure 5: Location of ST-6 and ST-7.

ST-7 is located on the stomach meridian, under the zygomatic arch. Palpating from the tragus toward the face, the practitioner first feels the condylar head and then there is a triangular

depression between the mandibular notch and zygomatic arch. The acupoint is located in the depression (Figure 5). When the mouth is wide open, the condylar head bounces up from the depression, and when the mouth is closed, the depression can again be felt. Insertion of the needle penetrates masseter muscle to reach the fascia of lateral pterygoid muscle or the muscle itself, and the stimulation of these muscles brings relief of tenderness.

SI-18 is on the small-intestine meridian and is located below the zygomatic process from the frontal view. It is on the perpendicular line made from the lateral canthus, on the same horizontal level of the crosspoint of the nostril and nasolabial fold (Figure 6). Insertion of the needle at the acupoint penetrates buccinators muscle and then reaches the fascia of the masseter muscle to stimulate the analgesic effect to the fatigued muscle.

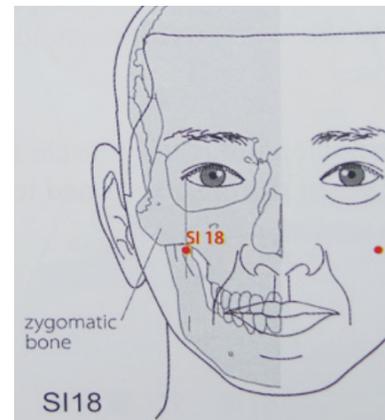


Figure 6: Location of SI-18.

The governor meridian runs along the centre of the human body and circles around it. GV-20 is on the topmost of this meridian and is located at the midpoint of the connecting line of two auricular apices (Figure 7). The needle should be inserted from the anterior to the posterior, at an angle approximately 30 degrees to the skin surface at a depth of approximately 1.0 to 1.5 cm. GV-20 is considered to be effective in treating TMD symptoms through emotional relaxation.

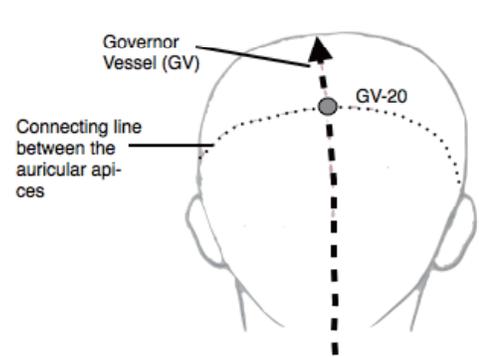


Figure 7: Location of GV-20.

GB-20 is on the meridian of the gall bladder and is located posterior to the mastoid process and inferior to the occipital bone in the depression between the sternocleidomastoid muscle and the trapezius muscle (Figure 8). From the perspective of Chinese medicine, GB-20 has long been used to cure headaches, migraines and stiff necks, to relief the muscle pain of the posterior triangle of the neck. BL-10 is located on the meridian of the bladder. This acupoint is on the depression lateral to the trapezius muscle, at the same level of the spinous process of the second cervical vertebra. Insertion of the needle at the acupoint penetrates trapezius muscle beneath the skin and relieves neck and shoulder pain, as well as dizziness and headache (Figure 8).

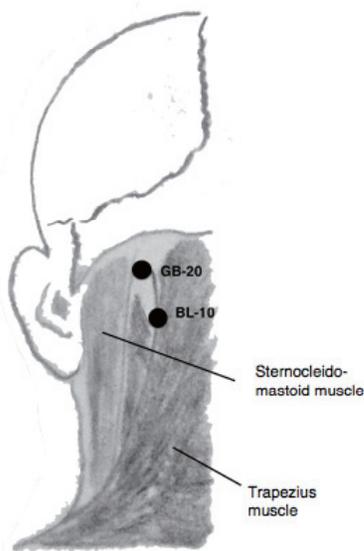


Figure 8: Location of GB-20 and BL-10.

LI-4 is located on the meridian of the large intestine on the dorsum of the hand, between the thumb and index finger, radial to the midpoint of the second metacarpal bone (Figure 9).

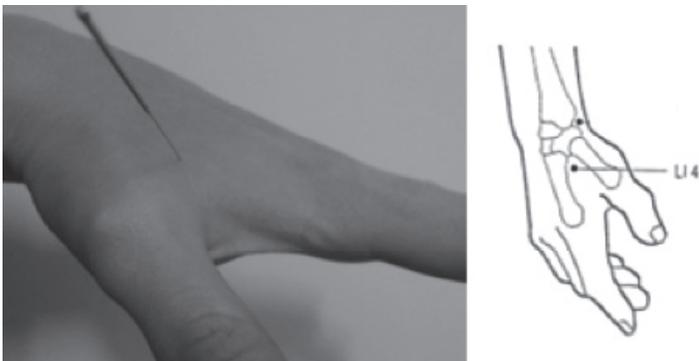


Figure 9: Location of LI-4.

Various authors have documented that acupuncture therapy proves to be a valuable aid in controlling TMDs. In a study con-

ducted by List et al. (1992), [48,49] patients with symptoms of TMD were randomly divided into 3 separate treatment groups (acupuncture treatment, occlusal splint therapy, and a control group that received no treatment). The results showed that acupuncture produced better subjective results with statistical significance, compared to occlusal splint therapy. A one year follow up demonstrated that a year after termination of treatment the effect of acupuncture was still beneficial compared to occlusal splint. Similarly, Barrero (2012) [50] stated that acupuncture was comparably effective to decompression splints, in the treatment of TMJ pain dysfunction syndrome. The patients treated with acupuncture reported improvements in all parameters (i.e., reduced subjective pain, stronger pressure to produce pain on masticatory muscles, increased mouth opening range), and the pain reduction was statistically significant in comparison to treatment with decompression splints. Bergström et al. (2008) [51] has documented long term results of acupuncture even after 18-20 years of treatment. Systematic reviews by Cho et al. (2010), [52] Ritenbaugh et al. (2008) [53] and Rosted et al. (1998) [54] have suggested acupuncture as an effective intervention to reduce TMDs symptoms. In July 2010, the Clinical Journal of Pain published a meta-analysis of multiple studies suggested that acupuncture may serve as a “reasonable adjunctive treatment” for patients with temporomandibular disorder syndromes [55]. Many trials covering TMD have shown that benefit obtained by acupuncture therapy is comparable to occlusal splint therapy. Johansson and colleagues (1991) [55] compared acupuncture to 3 to 7 local points and 1 distant point (LI 4) with maxillary full-coverage occlusal splints made of acrylic resins and an untreated control group. Ninety percent of the acupuncture group and 86% of those who received occlusal therapy improved, and both the subjective symptom scores and objective clinical examination scores were significantly better for both treatment groups compared with the untreated controls, with no significant difference between the 2 active groups. Similarly, Raustia et al [56-58]. (1985) compared the efficacy of acupuncture with standard treatment methods in the management of TMD. Fifty patients randomly divided into two groups one group was treated with acupuncture and one group, with a standard stomatognathic treatment: occlusal adjustment, physiotherapy, decompression splints or a combination of these. No statistically significant differences between treatments were found.

Xerostomia: Xerostomia (dry mouth), a decreased production or total lack of saliva secretion, is a common clinical phenomenon, and is present in about 40% of adults over the age of 50 years. It is a common side effect of many medications, but may also be due to therapeutic irradiation, autoimmune disease and endocrinological disorders [59] Associated clinical problems include difficulty in speaking, eating and swallowing, decreased sense of taste, ulceration or soreness of the mouth, greater incidence of fungal infection and rapid progress of dental caries. A major prosthodontic

limitation may be poor denture retention.

Treatment for xerostomia is mainly palliative. There are many ways of alleviating the discomforts of dry mouth, primarily by using saliva substitutes, and stimulating the salivary flow by sucking lozenges or by gum chewing. Various authors have documented that therapies designed to stimulate secretion may be directed locally or systemically (pilocarpine hydrochloride, anetholetrithione, bromhexine or amifostine therapy) [33,59,60] However certain disadvantages have been reported such as short-lived effects of therapy, frequent application, adverse effects like sweating, urinary frequency, rhinitis and dyspepsia. Prosthodontic treatment, in terms of fabrication of complete dentures with artificial salivary reservoirs, has a limitation that it can be fabricated only for patients with adequate interarch space. Also, the procedures advocated in literature are time consuming and have additional technique sensitive laboratory steps. Acupuncture provides statistically significant, and often long-term, improvements in salivary flow rates for people with xerostomia, even in patients who are otherwise refractory to the best current medical management available [1,2,61]

The mechanism behind how acupuncture can increase Salivary Flow Rate (SFR) can be a placebo effect as shown in Pavlovian conditioning, in which expectation alone from those receiving treatment can induce saliva production. Local acupoints in the head and neck region may also directly stimulate the nerves innervating the salivary glands [17]. Some authors suggest that the release of neuropeptides from acupuncture treatment can affect blood flow, have anti-inflammatory properties and trophic effects on salivary glands [11,59,62]. In a descriptive study, cortical regions were evaluated using functional magnetic resonance imaging on volunteers undergoing acupuncture treatment. It was observed that acupuncture treatment activated the parietal, rolandic and frontal operculum as well as the insula, which overlapped with the regions involved in gestation and salivation. The authors proposed that acupuncture treatment may tap into the neuronal circuit which activates the salivary nuclei in the pons and subsequently the salivary glands via the cranial nerves [63] Radio immunoassay analysis has been used to examine xerostomia patients and has determined that acupuncture significantly increases both vasoactive intestinal polypeptide and calcitonin gene related peptide in their saliva [64-68].

Most of the treatment provided in research that relates to acupuncture and xerostomia has involved placing needles at numerous points both locally (in the area of the major salivary glands) and distally (on the arms and legs). In some studies, the number of treatment sessions has ranged from 20-24 [64,69,70]. In recent years, an acupuncture treatment protocol for xerostomia has been developed that involves fewer acupuncture points and a great reduction in the number of treatment sessions [60,71]. A regimen of three to four weekly treatments followed by monthly sessions is now recommended, although some patients achieve lasting response without further therapy. Single treatment with eight needles

is now used. Three points (Figure 10) are treated in each ear: Shenmen (to calm the mind, reduce inflammation and hypersensitivity and to support other auricular points), point Zero (designed to bring about homeostasis), and Salivary Gland 2/Prime. One point is needled bilaterally at the radial end of the distal phalangeal crease of the index finger, on the border of the red and white skin (Figure 11). Patients are also provided a sugar-free lozenge in the mouth to further stimulate salivation [60]

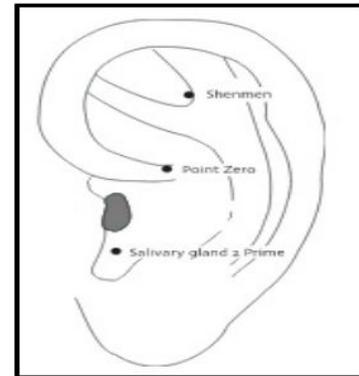


Figure 10: Acupoints Shenmen, Point zero and Salivary gland 2 Prime.

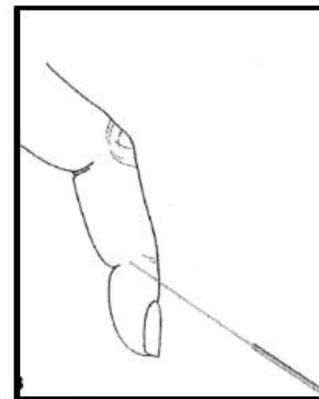


Figure 11: Acupoint LI-2 on index finger.

The use of acupuncture as a treatment for xerostomia was first reported by the Western medical literature in 1981, [68] and since 1992, Blom et al. have published numerous articles concerning the effectiveness of acupuncture in its treatment [61,65,69,70]. In observational studies, it was demonstrated that acupuncture may increase SFR in patients with xerostomia associated with disease. Blom & Lundeberg (2000) have documented that acupuncture treatment results in statistically significant improvements in SFR in patients with xerostomia up to 6 months and can maintain this improvement in SFR for up to 3 years [59]. Studies have demonstrated that acupuncture might serve as an effective long-term approach to the treatment of xerostomia and can significantly reduce untoward effects [60,69].

Safety: Unlike many drugs, acupuncture therapy is non-toxic and adverse reactions are minimal. However, risks from acupuncture have been reported, including risk of injury, rare infections, minor bleeding, small bruises, some dizziness, rare fatalities, serious infection (HIV, hepatitis, subacute bacterial endocarditis), anatomical trauma (pneumothorax, cardiac tamponade) and electro acupuncture suppression of a demand cardiac pacemaker [3] However, it must be appreciated that most of these result from ignorance of basic anatomy or failure of application of aseptic procedures by non-qualified practitioners. When standard infection control measures are applied, acupuncture proves to be a very safe technique in the hands of a properly trained practitioner. Dentists should only try acupuncture after having completed appropriate training programmer and having developed the necessary knowledge and skills. A separate informed consent for acupuncture may be required. As it is the case with all therapeutic measures, the use of acupuncture has to be documented appropriately and detailed records must be kept [1,3,13,72].

Addressing challenges in acupuncture research: Clinical studies of acupuncture present inherent problems associated of design and sample size, Limitations of acupuncture studies are in terms of use of appropriate controls, better definition of the placebo and sham acupuncture treatment, conducting double-blind trials and randomization. Blinding the subjects is a challenge as they will be able to tell, through the needling sensation, whether they belong to the treatment or control. The influence of specific needling parameters which bring about therapeutic effects is still poorly understood and there has been little investigation on the importance of needle placement location and depth, type and intensity of stimulation and number of needles to be used.

Summary

The use of acupuncture in dentistry in general and prosthodontics in particular may provide an added dimension to the patient orientated holistic treatment approach that all healthcare providers strive to achieve. However, it should be regarded as a supplement to conventional treatment. More clinical research on its possible application in dentistry can be conducted in dental institutions worldwide. After its effectiveness and efficacy in complementing conventional treatment have been sufficiently evaluated, acupuncture can be implemented as valuable addition to the therapeutic armamentarium for dental patients in the near future. Clinicians may expand the scope of his or her practice by taking additional training to administer acupuncture. These skills may be acquired with a short postgraduate or diploma training programmer, which would provide an extra edge to the patient-oriented holistic treatment approach that all health care providers strive to achieve. Multidisciplinary research into the effective use of acupuncture in dentistry should be encouraged. Teaching and professional training in acupuncture can be considered as an optional part of undergraduate,

postgraduate and continuing professional development.

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