



## A Review on the Efficacy of Acupuncture to Prevent Nausea and Vomiting after Strabismus Surgery

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Received: 16 Apr 2017

Revised: 18 May 2017

Accepted: 21 May 2017

### Abstract

Strabismus surgery, as a common operation, is associated with post-operative nausea and vomiting, which may increase in intraocular eye pressure and this can have some bad influences on outcomes of ophthalmic surgery. Different methods such as acupoint stimulation have been utilized to reduce this complication. This paper is a review on the effect of different types of acupoint stimulation in prevention of nausea and vomiting after strabismus surgery. This review evaluates and summarizes the outcomes of 8 papers, published from 1991 to 2015, which were identified through a careful search in PubMed and Google Scholar. There are many factors that can affect testing results of acu-stimulation methods for controlling nausea and vomiting after strabismus surgery. Although many studies have confirmed acupoint stimulation as a useful method, there are some papers with different results. Most of studies indicate that the application of acupoint stimulation in a suitable clinical setting can reduce nausea and vomiting after strabismus surgery. More studies in various clinical-conditions should be scheduled to improve evidence-based guidelines.

**Keywords:** Acupressure, Acupuncture, Nausea, Vomiting, Strabismus surgery, Anesthesia

**Citation:** Hasheminasab FS, Ayati MH. A Review on the Efficacy of Acupuncture to Prevent Nausea and Vomiting after Strabismus Surgery. Trad Integr Med 2017; 2(2): 90-97.

### Introduction

One of the most common complications after general anesthesia and surgery is nausea and vomiting [1, 2]. Prevalence of post-operative nausea and vomiting depends on many factors including site of operation, kind of surgery and anesthesia [3].

Strabismus correction is an operation which is associated with high prevalence of post-opera-

tive nausea and vomiting [4]. In some procedures such as ocular surgeries, controlling nausea and vomiting is more important. Because nausea and vomiting may increase in intraocular eye pressure and this can have some bad influences on outcomes of ophthalmic surgery [5]. Some anesthesiologists describe this complication as “big little problem” [6]. On the other hand, strabismus surgery is relatively a common operation in pediatric field [7].

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In order to prevent this trouble, many researchers worked on pharmacological drugs, several on non-pharmacological methods and some of them compared these chemical substances with those non-pharmacological strategies [8-10].

Acupuncture and acupressure are non-pharmacological techniques and alternative methods which play important roles in several conditions such as this problem [7, 11]. According to meridian theory which is the most important part of traditional Chinese medicine, there are numbers of pathways in which “Qi” and “blood” flow in the body throughout them. The performance of acupressure and acupunctures is based on stimulating some specific points which are known as acupoints on this meridians channels [12, 13]. Both acupressure and acupuncture use the same acupoints and meridians. Acupressure utilizes gentle pressure for stimulation of acupoints so it is known as the acupuncture without needle [12]. Low-level laser is sometimes employed for instigation of this points [14].

In accordance with traditional Chinese medicine, the imbalance of human body states is accompanied by surgery. It leads to Qi and blood flowing disturbance-causing stomach Qi to go upward and nausea and vomiting will finally occur.

PC6 is the most popular acupoint that is used to preventing nausea and vomiting. Stimulation of this point suppresses stomachs Qi adverse flow and leads to avoiding post-operative nausea and vomiting [3, 15]. Pharmacological drugs can be classified in one of these groups: 1- traditional antiemetics such as metoclopramide and dimenhydrinate, 2-non-traditional antiemetics for example dexamethasone and 3-antiserotonins like ondansetron [7].

For preventing post-operative nausea and vomiting, acupressure and acupuncture are relatively safe methods compared with various side effects of pharmacological agents [16].

The objective of this systematic review is to

evaluate the effectiveness of acupuncture and acupressure for limiting of nausea and vomiting after strabismus surgery. Moreover, this question would be answered if they can be considered as a strategy of choice for management of nausea and vomiting after strabismus surgery.

## Methods

Systematic search was done with electronic databases including PubMed and Scholar Google without limitation of publication time. Studies in English were included.

The terms searched in Google Scholar in the terms “all of these words” and “at least one of these words” were as: acupressure strabismus or acupuncture strabismus, and nausea vomiting respectively. The terms which were searched in PubMed were acupressure OR acupuncture [title/abstract], nausea OR vomiting [title/abstract], strabismus surgery [title/abstract].

We wanted to have a comparison on trials that have directly compared the effectiveness of acupressure/acupuncture with placebo/drug on post-operative nausea/vomiting after strabismus surgery and it was the most important reason that we focused on title or abstracts of articles. Most of the articles in scholar Google were the same as those detected in PubMed. At last throughout 9 illegible articles, due to inaccessibility of full-text of one article, we just used its abstract and one article was completely inaccessible.

After the selection of articles, studies evaluations were done individually. The data for study quality, sample size, age range, dose and kind of drugs for anesthesia, incidence of post-operative nausea and vomiting in different times, duration between stimulation of acupoints and induction of anesthesia, selection of acupoints, and method of stimulation (laser, acupressure, and acupuncture) were obtained on each paper. Then comparison of elements was done accord-

ing to these important factors in each study.

## Results

In this study, accessible papers were evaluated to clarify the relation between stimulation of acupoints and post strabismus surgery nausea/vomiting [8, 11, 14, 16-20]. Stimulation of acupoints could be a laser stimulation [11, 14], acupuncture [19] or acupressure [8, 16-18, 20]. These 8 trials involved 631 patients who underwent strabismus surgery. Ranging of the sample size was from 40 to 200 [8, 11, 14, 16-20]. Age of participants in the studies was between 1 to 60 year old.

Studies showed different effects of the same method. There were five studies that employed acupressure for evaluating its effectiveness on post strabismus surgery nausea and vomiting. The influence of acupressure was confirmed by four of them [8, 16-18, 20]. The review showed that one of the differences between these five papers was the duration of acupressure. Those papers that confirmed the acupressure effects were designed in an admission situation, with at least pressure stimulation for 6 hours [8, 17, 18, and 20]. An outpatient situation with maximum duration of acupressure for 3 hours was designed for the study in which the effect of acupressure was not confirmed [16].

Laser stimulation of acupoints was used in two studies, and both of them evaluated this method as a beneficial one [11, 14]. Only one study used acupuncture for prophylaxis of nausea and vomiting after strabismus surgery [19]. This study compared acupuncture with droperidol as well as both of acupuncture and droperidol, and the authors concluded that effectiveness or ineffectiveness of droperidol and acupuncture were the same.

The majority of trials utilized stimulation of acupoint PC6 (Nei-Guan) compared with chemical drug or placebo for prevention of nausea or

vomiting while in one study in Korea hand acupuncture point K-K9 was used [18] and another study, BL-10 (Tianzhu), BL-11 (Dazhu) and GB-34 (Yanglingquan) were employed [17]. In one study both acupoints PC6 and Liv3 were stimulated [11].

According to laterality, stimulation of acupoints were bilateral in 6 trials [8, 11, 14, 16-18], whereas in one article only right side was stimulated [19], and in another one, it was not reported if stimulation was bilateral or not [20]. The authors of all these 8 articles tried to exclude patients with some other symptoms or conditions; Schlager et al. (1998) and Schlager et al. (2000) [14, 18] excluded patients with gastrointestinal diseases, positive history of nausea or vomiting a week before surgery and those who take medication exactly before surgery, in their studies. Exclusion criteria of the work of Soltani et al. (2010) [8] were those patients who refused for enrolling in the study, nausea or vomiting in previous week to surgery, those who received medication immediately before surgery, existence of acupoint site infection and patients with history of medical illness or travel sickness. Previous history of gastrointestinal disease, travel sickness, motion sickness, hyper sensitivity to sea band during usage, and patient refusal were exclusion factors for Nikbakht et al. (2011)[20] study. Levis et al. (1991) [16] excluded patients who had had anatomical or neurological upper limb abnormalities. Saleh (2014)[11] excluded patients with diabetic mellitus, gastro esophageal reflux, and cardiovascular disease, usage antihistaminic or antiemetic during a day before the operation. Yentis et al. (1992)[19] did not suggest any exclusion criteria in their trial. The study of Chu et al. (1998) [17] was not available so the exclusion criteria of their study was not evaluated.

The time between acupoints stimulation and the induction of anesthesia in acupressure method was at least 30 minutes [8, 18, 20], this time

in the study of Levis et al. (1991)[16] was one hour and in the study of Chu et al. (1998)[17] lasted more. In the studies that applied laser for stimulating of acupoints, the time was 15 minutes between stimulation and induction of anesthesia. In this method, laser stimulated acupoint for 30 seconds and another laser stimulation occurred 15 minutes after arriving in the recovery room. Despite the precedence of stimulation to the induction of anesthesia in all 7 previous studies, acupuncture in Yentis et al. (1992)[19] study was exactly applied after induction of anesthesia.

The incidence of post-operative nausea and vomiting in 5 studies was checked in the first 24 hours [8, 14, 16-18], in one article in the first 12 hours [11], in one trial in the first 6 hours [20], and in one study, it was checked within 48 hours after surgery [19].

In two studies post-operative emesis was divided into three subgroups. They were retching, nausea and vomiting [8, 11]. One trial was divided to 2 subgroups as nausea and vomiting[20] and in 5 studies, only post-operative vomiting were determined [14, 16-19].

## Discussion

The aim of this review was to evaluate acupoint stimulation on prevention of post-operative nausea and vomiting after strabismus surgery. Thus, trials in which effects of acupressure, acupuncture or laser stimulation methods were compared with different chemical drugs or placebo. Different types of surgery and variant sides of operation have various incidence range of post-operative nausea and vomiting[3], therefore election of strabismus surgery was due to omission of the effect of surgery type on post-operative nausea and vomiting.

According to different study on preventing nausea and vomiting after strabismus surgery, non-pharmacological methods are as effective

as pharmacological techniques [3, 21]. In this review, most trials demonstrated the positive influence of acupoint stimulation. Statistical data of two studies showed that acupoint stimulation was not beneficial for preventing post strabismus surgery nausea and vomiting[16, 19].

It was important to know the influence of time between acupoint stimulation and induction of anesthesia on prevalence of post-operative nausea and vomiting. In a randomized study, the effect of timing of PC6 stimulation was assayed. This trial in a gynecological field showed that late acupuncture which is done during operation in comparison with early acupuncture which is administered with premedication had less associated with controlling post-operative nausea and vomiting [22]. So, this result recommends that stimulation of PC6 acupoint similar to antiemetic chemical drugs should be given before the emetic procedure for the more influence [23]. Another study confirmed that involving neural system with anesthesia could decrease the effect of PC6 stimulation on post-operative nausea and vomiting [24], therefore anesthesia should be after stimulation of acupoints.

Another characteristic was duration of pressure in acupressure technique. Among the 3 articles on effects of PC6 acupressure [8, 16, 20], pressure time in one study was less than the others [16]. This study was in outpatient situation, participants' age between 3 to 12 years and average age of 5.2 year old in placebo group and 5.8 year old in acupressure group with pressure time up to 3 hours. The authors concluded that although antiemetic effect of PC6 stimulation in adult, PC6 acupressure could not decrease the prevalence of vomiting following strabismus surgery in children [16]. In spite of this trial, later studies, which measured the effect of exactly PC6 acupressure, suggested that this method could reduce post-operative nausea and vomiting after strabismus surgery [8, 20]. In the study of A Ebrahim Soltani et al. [8] participants age was between

10 to 60 years, average age was  $19.44 \pm 10.12$  in acupressure group,  $17.68 \pm 8.52$  in metoclopramide group,  $22.04 \pm 11.97$  in ondansetron group and  $18.06 \pm 9.29$  in placebo group. Participants' age in A Nikbakht Nasrabadi et al. (2011) [20] study was between 12 to 65 years and most patients in both placebo and acupressure groups were between 10 to 30 years. Pressure time in these 2 studies were more than 6.5 hours [8, 20]. So with comparing articles, it was concluded that not only age is a factor that affects on the result of PC6 acupressure but also the duration of stimulation can induce its influence.

Several studies declared that any kind of acupoint stimulation has fewer side effects than pharmacological methods [3, 8, 11, 16, 21, 23]. Although some trials did not approve acustimulation methods for preventing nausea and vomiting after surgery, there are many evidence that indicate different methods of acupoint stimulation can decrease post-operative nausea and vomiting, for instance, strabismus surgery. So, for improving evidence-base guidelines, more studies should be scheduled in various clinical-setting.

### **Conflicts of Interests**

Authors have no conflict of interests.

Article	Study quality	Sample size	Age range (year)	Kind and dose of drugs for anesthesia	Selection of acupoints	method of stimulation	Duration between anesthesia and stimulation and duration of stimulation	Incidence of post-operative nausea vomiting in placebo/drugging group	Incidence of post-operative nausea vomiting in acupuncture (percentage)
A EbrahimSoltani et al. (2010)	randomized, prospective, double-blind, placebo-controlled trial	200 50:placebo 50:ondansetron 50:metoclopramide 50:acupressure	10-60	5 mg/kg thiopental and 0.5 mg/kg atracurium maintained with halothane IMAC in 50% N <sub>2</sub> O-O <sub>2</sub> and atracurium 0.2 mg/kg when deemed necessary	PC6 points bilateral	Acupressure wrist bands	30 min before anesthesia Bands were removed six hours later	Placebo-ondansetron-metoclopramide Recovery: R:0-0-0 N:8-4-6 V:16-0-6 Ward: R:20-2-10 N:38-18-14 V:46-18-10	Recovery: R:4 N:0 V:0 Ward: R:8 N:12 V:20
A Nikbakht Nasrabadi et al. (2011)	randomized double-blinded clinical trial	60 30:acupressure 30:control	12-65	?	PC6 point Was not record Unilateral or bilateral	Acupressure with sea-band on the PC6 point	30 minutes before induction of anesthesia Bands were removed six hours after surgery	Recovery: No nausea:53.3 1-4 episode:16.7 5-7episode:23.3 8-10episode:6.7 1th 6 hours: No nausea:46.7 1-4 episode:40 5-7episode:13.3 8-10episode:0	Recovery: No nausea:86.7 1-4 episode:10 5-7episode:3.3 8-10episode:0 1th 6 hours: No nausea:86.7 1-4 episode:13.3 5-7episode:0 8-10episode:0
A.Schlager. et al. (2000)	Double blind, randomized, placebo-controlled	50 Acupressure:25 Placebo:25	3-12	Thiopental 5mg/kg Rocuronium bromide 0.6mg/kg Fentanyl 2µg/kg Maintenance:2-3% sevoflurane and nitrous oxide in 33% oxygen	Korean hand acupuncture point K-K9 bilateral	Acupressure disc	30 minutes before induction of anesthesia and was maintained for at least 24hours	Time of first vomit after surgery: 0-3hour:40 0-6hour:56 0-12hour:68 0-24hour:68	Time of first vomit after surgery: 0-3hour:12 0-6hour:20 0-12hour:20 0-24hour:20
Chu YC et al. (1998)	randomized double-blinded clinical trial	65 Acuplaster:34 Placebo:31	3-14	Anesthesia: maintained with halothane and nitrous oxide in oxygen	BL-10 (Tianzhu), BL-11 (Dazhu) and GB-34 (Yanglingquan) bilateraly	Vital Point Needleless Acuplaster (Koa, Japan)	Night before surgery till????	early emesis phase:35.5 late emesis phase:58.1 overall in 1th 24hours:64.5	early emesis phase:14.7 late emesis phase:23.5 overall in 1th 24hours:29.4

Article	Study quality	Sample size	Age range (year)	Kind and dose of drugs for anesthesia	Selection of acupoints	method of stimulation	Duration between anesthesia and stimulation and duration of stimulation	Incidence of post-operative nausea vomiting in placebo/drug group	Incidence of post-operative nausea vomiting in acupuncture (percentage)
I.H.Levis et al. (1991)	Randomized, prospective, double-blind	66 Acupressure:31 Placebo:33 (outpatient)	3-12	1-5% halothane and 66% nitrous oxide and oxygen, Via a face mask Maintenance: 0.5—1% halothane,	PC6 point bilateral	Acupressure with Sea-bands Elasticated wrist bands	1h before operation until Discharge from hospital the same day	Within hospital:0-2h:58 At home:2-24h:73 Overall:0-24h:82	Within hospital:0-2h:58 At home:2-24h:71 Overall:0-24h:94
A.Schlager et al. (1998)	Double blind, randomized, placebo-controlled	40 Laser:20 Placebo:20	3-12	Thiopental 5mg/kg Rocuronium 0.6mg/kg Fentanyl 2µg/kg Maintenance:2-3% sevoflurane and 66% nitrous oxide in oxygen	PC6 point bilateral	Low level laser Diode laser with continuous laser beam Power output:10 mW Wavelength:670nm	Over 30 s 15 minutes before anesthesia induction and 15 minute after arriving in the recovery room)	Vomiting:85	Vomiting:25
R. H. Saleh (2014)	prospective, randomized and patient-blinded	60 Laser acupuncture:20 Ondansetrone:20 Control:20 (on N/V and hemodynamic response)	3-12	Thiopental 4-7 mg/kg, atracurium 0.5 mg/kg and fentanyl 1µg/kg Maintenance: 2-3% sevoflurane	PC6 and Liv3 bilateral	low level laser continuous laser beam; red light with wave length between 635 and 670 nm	over 30 s, 15 min before induction of anesthesia and 15 min after arriving in the recovery room	Ondansetrone-control 0-1h: R:10-35 N:5-20 V:15-30 Total:30-85 1-12h: R:15-35 N:15-20 V:10-30 rescue:35-85	Acupuncture 0-1h: R:15 N:5 V:15 Total:35 1-12h: R:20 N:10 V:15 rescue:40
S.M. Yentis et al. (1992)	randomized, patient- and observer-blinded study	90 droperidol (D):30 acupuncture+droperidol (AD):30 Acupuncture (A):30 (outpatient)	1-16	thiopentone 5mg/kg Atropine 0.02mg/kg succinylcholine 1.5 mg/kg nitrous oxide 66% and halothane 1.5-2.0% in oxygen	PC6 point on the right side	sterile disposable 0.2 mm diameter acupuncture needles	after induction of anesthesia before surgery with five minutes manual stimulation	Vomiting pre-discharge: D:17 AD:17 Vomiting in total: D:41 AD:34	Vomiting pre-discharge: A:27 Vomiting in total: A:45

**STRICTA**

V: Vomiting

N: Nausea

R: Retching

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