Lung (1983) 161: 321–326

Lung

Original Articles

Effect of Acupuncture on Exercise-Induced Asthma

Olivia K. W. Chow, S. Y. So*, W. K. Lam, D. Y. C. Yu and C. Y. Yeung

Departments of Paediatrics and Medicine, University of Hong Kong, Hong Kong

Abstract. Sixteen young asthmatic patients with exercise-induced asthma participated in a single-blind trial comparing the protective effects of needle auricular acupuncture over the lung loci and those over the lumbago loci (serving as sham points). Effects were assessed from the mean maximal percentage fall in forced expiratory volume in one second (FEV_1) after running on a treadmill for 8 min. There was no significant change in baseline FEV_1 and maximal flows at 50% and 25% of vital capacity ($\dot{V}_{50}$ & $\dot{V}_{25}$) after true and sham acupuncture, suggesting that auricular acupuncture at the loci chosen did not alter the basal bronchomotor tone of our asthmatic patients. There was also no significant difference in the percentage fall of FEV_1 after exercise between the control run and those after true and sham acupuncture. Therefore auricular acupuncture offered no protection against exercise-induced asthma.

Key words: Acupuncture – Asthma.

Introduction

Acupuncture has been employed in China as a therapeutic and diagnostic measure since 400 B.C. [1], and bronchial asthma is one of the many diseases for which acupuncture is claimed to be useful. Subjective relief of symptoms and objective improvement in spirometry had been reported following acupuncture at specific points either manually [5] or with electrostimulation [4] during clinical attacks of asthma. Acupuncture is also claimed to have prophylactic value [1], but so far no study has been done. We therefore chose exercise test as a simple and reproducible model of asthma and tested the protective effect of acupuncture against exercise-induced bronchoconstriction.

* To whom offprint requests should be sent at University Medical Unit, Queen Mary Hospital, Pokfulam, Hong Kong

Patients and Methods

Subjects

Sixteen patients aged 8–13 (mean, 11 years of age) were studied. All gave a history of episodic dyspnoea with wheezing consistent with asthma and had records of spontaneous variability in FEV_1 of more than 20%. All subjects were atopic as indicated by skin prick tests with extracts of common, local allergens (Bencard Allergy Service) and had history of exercise-induced asthma. They were receiving regular oral and aerosol bronchodilator therapy for control of their symptoms and in addition five were taking sodium cromoglycate. At the time of study symptoms were either absent or readily controlled by medications. The nature and reason for the study were fully explained to them by one of us (O.C.) and informed consent was obtained. None of them had ever experienced acupuncture previously. Possible effects of this treatment were not suggested. The protocol for the study was approved by the University ethics review committee.

Exercise-Test

Testing was done by running on a treadmill (Avionics 3600). Each test was performed at intervals of one week and at the same time of day on each occasion. Before the test, β_2 adrenergic agonists and oral theophyllines were stopped for at least 8 h (12 h for sustained release preparations) and sodium cromoglycate for 24 h. Testing was done only when the patient had a stable $FEV_1 \geqq 75\%$ of predicted or of the highest previously obtained value. FEV_1, $\dot{V}_{50}$ & $\dot{V}_{25}$ were measured with a digital pneumotachograph (Hewlett Packard 47401A) connected to an X-Y recorder (Hewlett Packard 7004A). The pneumotachograph had been calibrated with a three-litre syringe (Warren E. Collins). The best of at least 3 forced expirations was chosen on each occasion. The test was performed using steady-state treadmill running exercise. The speed of the treadmill was set at 8 km/h and the slope at a 8% gradient. The intensity of work was such that the heart rate would exceed 170 beats/min during the last 3 min of the test. The duration of exercise was 8 min. Readings were taken before exercise, at 2 min during exercise, immediately and at 5, 10 and 15 min or longer following exercise until they started to improve. After the final measurement it was usual to administer 200 μg salbutamol by inhalation to patients so that recovery from post-exercise bronchoconstriction could be made more complete. Ambient air temperature ranged from 18°–21 °C (mean 20.3°, SD 0.92°) and relative humidity, 50–90% (mean 78%, SD 9.71%). Analysis of variance showed that there was no significant difference in ambient air temperature and humidity between the 3 runs. No acupuncture was done on the first run. For the subsequent 2 runs, acupuncture was performed 10 min before exercise.

Acupuncture

Two points over the external ear were chosen for acupuncture: the lung point which was specific for the treatment of asthma and the lumbago point which served

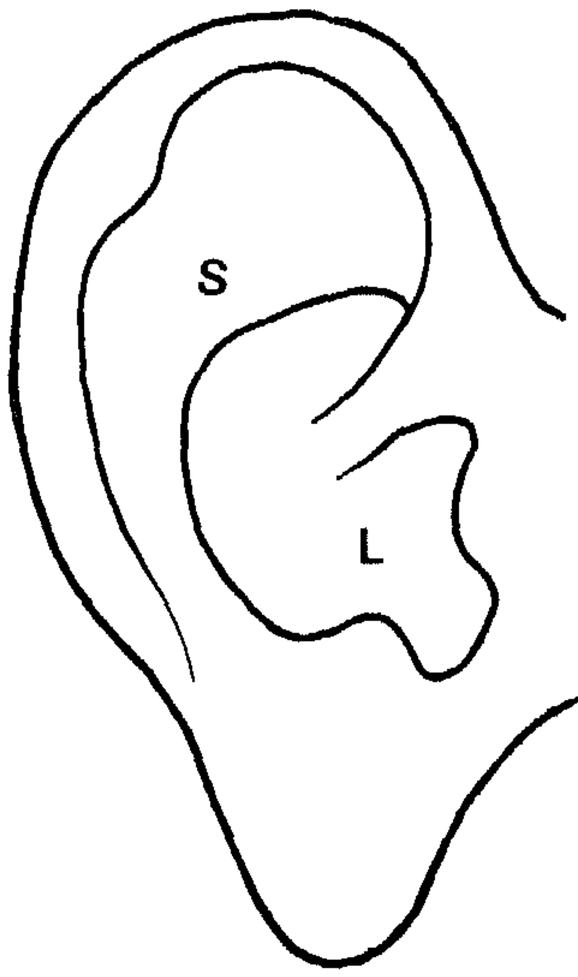

Fig. 1. External ear showing the lung locus (*L*) and the sham locus (*S*)

as the sham point for our study (Fig. 1). The auricular points were chosen rather than those over the trunk because auricular acupuncture was more convenient and safe. The lung point was located at cavum conchae and the lumbago point near the antihelix (Fig. 1). Since accurate localization of lung points was essential for the therapeutic effect, they were defined first with the help of an electrical probe (multipurpose electronic acupuncto-scope WQ-10B). This was based on the principle that acupuncture points would have a lower resistance to electrical current when diseases related to specific points were present; a buzzing sound was heard when the lung point was found, corresponding to the area with maximum skin conductance. The skin was first swabbed with ether. Autoclaved standard silver alloy acupuncture needles (5 cm long, 0.2 mm diameter) were then inserted, without local anaesthesia, perpendicular to the skin to a depth of about 0.3 cm. Position of the needle was considered to be correct when the patient complained of a local numbness, distension or paraesthesia, and the acupuncturist sensed a gripping and tugging sensation on the needle. After insertion, the needle was then rotated manually, clockwise and anticlockwise, at a rate of 1 cycle/s to strengthen the stimulation. The rotation of the needle lasted for 1 min each time and was repeated twice in 10 min. Readings of forced expiratory manoeuvre were taken before and 10 min after acupuncture to assess its effect on basal bronchomotor tone. The needle was then left-in-situ throughout the exercise test and removed when the patient had recovered from the post-exercise bronchoconstriction. Ear-needling was done by the same acupuncturist (M.C.C.) for all patients on all occasions. Both ears were needled each time. The order of puncturing the lung points and the sham points was randomised and patients were not told of the points being stimulated.

Expression of Data

To quantitate the severity of exercise-induced asthma, the change in spirometry was expressed as follows:

$$\%\text{fall} = \frac{\text{value immediately before exercise} - \text{lowest value after exercise}}{\text{value immediately before exercise}} \times 100$$

Statistical analysis of data was done with two-way analysis of variance and paired t-test. Arcsin transformation was used when percentage values were evaluated [2].

Results

Effect of Acupuncture on Basal Bronchomotor Tone (Table 1)

There was no significant difference between FEV_1, $\dot{V}_{50}$ & $\dot{V}_{25}$ before and after acupuncture. This was true for both the lung point and the sham point. Acupuncture at these auricular points, therefore, did not influence the basal bronchomotor tone of our patients, either at the large airway or the small airway level.

Effect of Acupuncture on Exercise-Induced Asthma (Table 2)

No patient reported subjective improvement in dyspnoea after exercise with true or sham acupuncture pretreatment. The objective tests were assessed in 3 ways:

1. The % fall in FEV_1, $\dot{V}_{50}$ & $\dot{V}_{25}$ after exercise between the control run and those after acupuncture were statistically compared using each patient as his own control. The mean fall in FEV_1 for the control run was 40.2%, and that with true acupuncture pretreatment 27.5%, and that with sham acupuncture treatment 31.9%. No significant difference was found between the 3 runs. For simplicity only changes in FEV_1 are shown in Table 2.

2. The proportion of patients who, after acupuncture, experienced a fall in FEV_1 of less than 10% following exercise was determined. It was 25% with acupuncture at the lung point (subjects 8, 9, 11 and 12); and also 25% with acupuncture at the sham point (subjects 2, 6, 9 and 12). No specific protection was therefore provided by acupuncture.

3. The proportion of patients having more than 50% protection from exercise-induced asthma after acupuncture was also computed as follows:

$$\%\text{protection} = \frac{\%\text{fall after control run} - \%\text{fall after acupuncture}}{\%\text{fall after control run}} \times 100$$

This was 31.2% after acupuncture at the lung point (subjects 2, 8, 9, 11 and 12) and 37.5% after acupuncture at the sham point (subjects 2, 3, 4, 6, 9 and 12).

It was therefore obvious that acupuncture at these auricular points offered no protection against exercise-induced asthma in our patients.

Only two patients complained of earache after acupuncture; other side effects such as fainting and nausea were not seen.

Table 1. Effect of acupuncture on basal bronchomotor tone. Definition of abbreviations: FEV_1 = Forced expiratory volume in 1 s, $\dot{V}_{50}$ and $\dot{V}_{25}$ = maximum expiratory flow at 50% and 25% of vital capacity, L = acupuncture at lung point, S = acupuncture at sham point, B = baseline value, A = 10 min after acupuncture, SEM = standard error of the mean

	FEV_1 (L)				$\dot{V}_{50}$ (L/S)				$\dot{V}_{25}$ (L/S)			
	L		S		L		S		L		S	
	B	A	B	A	B	A	B	A	B	A	B	A
Mean	1.52	1.53	1.47	1.50	1.45	1.49	1.43	1.46	0.69	0.76	0.74	0.72
SEM	0.08	0.09	0.07	0.07	0.13	0.12	0.10	0.10	0.08	0.08	0.08	0.07

Table 2. Effect of acupuncture on exercise-induced asthma. Definition of abbreviations: C = control run, L = test with lung point acupuncture, S = test with sham point acupuncture, B = baseline value, PE = post-exercise value, % = % change in FEV_1

Subject	FEV_1 (l)								
	C			L			S		
	B	PE	(%)	B	PE	(%)	B	PE	(%)
1	1.69	0.74	(56.2)	1.98	1.02	(48.5)	1.88	0.82	(56.4)
2	1.47	0.80	(45.6)	1.50	1.35	(10.0)	1.21	1.23	(1.7)
3	1.81	1.18	(34.8)	1.57	1.03	(34.4)	1.28	1.07	(16.4)
4	1.09	0.45	(58.7)	1.18	0.78	(33.9)	1.28	0.93	(27.3)
5	1.39	0.66	(52.5)	1.12	0.41	(63.4)	1.25	0.45	(64.0)
6	1.38	0.74	(46.4)	1.21	0.88	(27.3)	1.35	1.23	(8.9)
7	1.86	1.24	(33.3)	1.47	0.92	(37.4)	1.45	0.67	(53.8)
8	2.02	1.63	(19.3)	2.08	2.05	(1.4)	1.89	1.38	(27.0)
9	1.66	1.20	(27.7)	2.11	2.01	(4.7)	1.56	1.53	(1.9)
10	1.27	0.98	(22.8)	1.14	1.00	(12.3)	1.30	1.09	(16.2)
11	1.41	1.19	(15.6)	1.54	1.72	(11.7)	1.67	1.17	(29.9)
12	2.01	0.94	(53.2)	2.08	1.93	(7.2)	2.06	1.91	(7.3)
13	1.49	0.90	(39.6)	1.40	0.76	(45.7)	1.34	0.83	(38.1)
14	1.66	0.47	(71.7)	1.24	0.61	(50.8)	1.27	0.35	(72.4)
15	1.44	0.83	(42.4)	1.48	0.77	(48.0)	1.80	0.81	(55.0)
16	1.17	0.89	(23.9)	1.40	1.03	(26.4)	1.49	0.93	(37.6)
Mean	1.55	0.92	(40.2)	1.53	1.14	(27.5)	1.50	1.02	(31.9)
SEM	0.07	0.07	(10.0)	0.09	0.12	(5.36)	0.07	0.10	(7.98)

Discussion

Auricular acupuncture at the points selected did not alter the basal bronchomotor tone of our patients with asthma. This was not surprising since we chose patients with stable asthma; other workers studied patients during acute severe attacks of asthma and were able to show that acupuncture had some bronchodilator effects [4, 5].

Our study also showed that auricular acupuncture offered no protection against exercise-induced asthma. The failure of response was unlikely to be due to faulty technique, because the lung loci had been accurately localised and great care had been taken to ensure that needling would produce the sensation of paraesthesia necessary for a therapeutic response. The duration of acupuncture was also adequate according to recommendation [1].

It was possible that the auricular loci might not be the best sites chosen for asthma. Other loci such as those at the back of the trunk might be superior; such loci however were not used in our study because bilateral pneumothoraces had been reported following acupuncture at these loci [3] and the risk would be higher in children with thinner chest walls.

In the traditional prophylactic treatment of asthma by acupuncture, one might stimulate the lung loci alone or use several loci simultaneously [1]; it could than be argued that in the present investigation the use of the lung loci alone would be inadequate to achieve the maximal effect. Multiple loci were not used here because it would then be difficult to know the specificity of loci should there be a response.

It is also possible, that several months of acupuncture might be required for a prophylactic effect to be seen [1], under such circumstances acupuncture probably would offer no advantage over traditional drug treatment.

It has also been shown that acupuncture did not inhibit histamine-induced bronchoconstriction [5]. The prophylactic role of acupuncture, at least with auricular loci, is therefore limited.

Acknowledgement. We thank the acupuncturist, Mr. Ma Chun Cheung, for his work, Miss May Poon and Mr. K. M. Lo for technical assistance, and Mrs. Monica Chan for secretarial help.

References

1. The Acupuncture Institute of the Academy of Traditional Chinese Medicine (1981) Essentials of Chinese acupuncture. Pergamon Press, Oxford
2. Bishop ON (1966) Statistics for biology. Longman, London
3. Mazal DA, King T, Harvey J, Cohen J (1980) Bilateral pneumothoraces after acupuncture (letter). N Engl J Med 302: 1365–1366
4. Wen HL, Chau K (1973) Status Asthmaticus treated by acupuncture and electro-stimulation. Asian J Med 9: 191–195
5. Yu DYC, Lee SP (1976) Effect of acupuncture on bronchial asthma. Clin Sci Mol Med 51: 503–9

Accepted for publication: 19 April 1983