

A Preliminary Study of Acupuncture on Electrocardiogram

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Abstract

Twenty-five meridian points were chosen in this report which used 85 students as subject. The electrocardiogram, blood pressure, and pulse rate of each point are recorded before, during, and after penetration, respectively. Only 12 points are shown sharp effect on electrocardiogram and among which were Feishu (B13), Yanglingquan (G34), Shenshu (B23), Huantiao (G30), Jianjing (G21), Daling (Cx7), Fengchi (G20), Zusanli (S36), Xinshu (B15), Jiexi (S41), Shenmen (H7), and Laogong (Cx8). Each of them can prolong R—R interval with an over 15% longer than before penetration. Seventy-three persons in 85 persons (85.9%) was shown a prolongation of electrocardiogram wave and interval. The cause to which induce an increase of the duration of cardiac cycle was primarily due to extending T—P interval. The inhibition of excitability and conductivity of cardiac muscle and its involved reflexes induced by penetration causing hereby the relaxation of whole heart proved mainly the results of this experiment.

Introduction

Acupuncture is one of the old systems of medical science in China and had been prevailing in all countries around the world in recent years, so that the related treatises are gradually increasing. However, the fundamental study of acupuncture on ECG is still quite few. The healing effect of acupuncture described in traditional Chinese medicine books was mostly resulted from conventional experiences or clinical secrets, and they were so confused that often to the same disease the treatment points

described in each book were different and indistinct (3, 7, 9, 11, 17). From the animal tests and the clinical observation made by Chinese as well as Western physicians, it is proved that acupuncture has the functions of dilating or constricting blood vessel, increasing the number of red blood cells and white blood cells, and regulating the blood circulation in human body (3, 5, 6, 9, 11, 13, 14). However, it is still lacking the experimental and statistical data as to which points are more effective to

electrocardiogram. Under the circumstances the writer attempted to record the electrocardiogram, blood pressure, and pulse rate during penetration on meridian points probably related to cardiovascular function.

Materials and Methods

Eighty-five male medical students in good health of our medical college had been tested and 25 meridian points related to cardiovascular activity were chosen from the books and literatures of acupuncture (3, 5, 6, 7, 9, 11, 14, 16, 17, 18). Before experiment, let tested student lie supine on a bed with a foam rubber pad thereon in a quiet room for a rest. Then measure his blood pressure with mercurial sphygmomanometer and pulse rate in his supine position and connect his four-limbs to portable electrocardiograph (New Cardiart Century FCC-1, Fukuda Medical Electric Co.), adjusting its sensitivity to 0.1mv/mm and speed to 25 mm/sec. Finally select the meridian point to be penetrated (4, 8, 11, 17) and choose the appropriate size of the sterilized platinum needles (#28-30). Insert the needle in vertical or oblique way according to the location of the meridian points. After insertion it is necessary for the student to feel the sensation of soreness, tightness, heaviness, and dullness and then begin to take duly recording from ECG. In order to be uniformity, all the ECG records taken were limited to Lead II. Rotate the needle if necessary and mark it to be distinguished. It will take about 30 minutes from needle insertion to withdrawal in each point. Afterwards, the student should take a rest for 20 minutes, and then the test of another point will be made in the same way as mentioned above. In doing so, after three to

five points were taken then the test was stopped. Twenty minutes later after the last penetration the ECG, blood pressure, and pulse rate were measured again in a supine posture. Occasionally the non-meridian (non-site) point was taken to determine how about the person's psychological effect on ECG (Fig. 4).

Results

The ECG pattern recorded during or after penetration is similar to that of normal condition (Figure 1, 2, 3). From the data of Table 1, it is found that the ECG change of Feishu (B 13), Yanglingquan (G 34), Shenshu (B 23), Huantiao (G 30), Jianjing (G 21), Daling (Cx 7), Fengchi (G 20), Zusanli (S 36), Xinsu (B 15), Jiexi (S 41), Shenmen (H 7), and Laogong (Cx 8) recorded during penetration were remarkable and had an over 15% increase of R—R interval (cardiac cycle) longer than that of before penetration. The increase of Feishu (B 13) is up to 21.1% and is the longest among them. An over 75% of total penetrations in each point mentioned above was shown R—R interval increase and that of Jianjing (G 21) and Huantiao (G 30) is up to 100% (Table 1). The prolongation of cardiac cycle during penetrating these points is the result from the extension of T—P interval (the line from the end of T wave to the beginning of P wave) or T wave (Fig. 1, 2, 3). From Table 2 we can see 21 points among 25 points prolonged T—P interval which was up to 84%, and meanwhile, after 85 students being inserted, 62 persons among them whose T—P interval was prolonged, were 72.9% in proportion, both of them were extremely consistent. Generally speaking, during penetraion

of all points used , the duration of R—R interval was prolonged average in 12.1 % longer than before penetration and T—P interval was prolonged average in 30 % . However , the other waves or intervals changed were not prominent in spite of the most of T wave became widening after penetration(Table 1 , 2) .

The above-mentioned effect are all of one single point. Besides , we also had carried out the study on some combination points , namely , on the effect of penetration of two different points at same moment. We found that the effect of combination points shown more prominent than that of single point , but not an algebraical result. Consequently the effect of Daling (Cx 7) plus Laogong (Cx 8) is greater than any one of the single point (Fig. 3) . Furthermore , it was found that the effect of combination points lengthening R—R interval is also due to T—P interval being extended.

In penetration of Zusanli (S 36) plus Laogong (Cx 8) or Neiting (S 44) , the effect shown no stronger result ; while in combination of Xinshu (B 15) with Dazhu (B 11) , then the effect was the most prominent among the combination points showing a 25 % in average prolongation of R—R interval with a 42 % of T—P interval.

The effect of acupuncture to blood pressure and pulse rate was shown in Table 3. There were 65 persons among 85 persons (76.4 %) whose blood pressure decreased after penetration , and 73 persons (85.9 %) whose pulse rate slowed down ; on the contrary , only 16 persons (18.7 %) whose blood pressure increased and only 5 persons (5.8 %) whose pulse rate turned to be quick. Besides , we found that Sanyinjiao (Sp 6) , Neiguan (Cx 6) , Yanglingquan (G 34) , and Shenshu (B 23) were practically effective to reduce blood pressure , and Xuehai (Sp 10) , Neiguan (Cx 6) , and Zusanli (

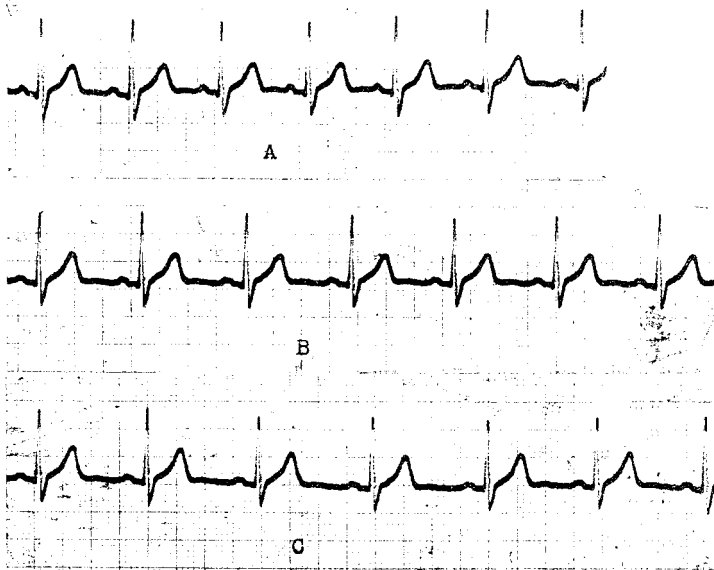


Fig.1 The ECG (1mv = 10mm , 25mm = 1sec.) of student C2 showing the difference of T—P interval and T wave among (A) before penetration (B. P. 125 / 81 mmHg , P. R. 82 / min.) (B) during penetration of point B13 (B. P. 122 / 80 mmHg , P. R. 79 / min.) , and (C) during penetration of point B15 (B. P. 115 / 75 mmHg , P. R. 75 / min.) .

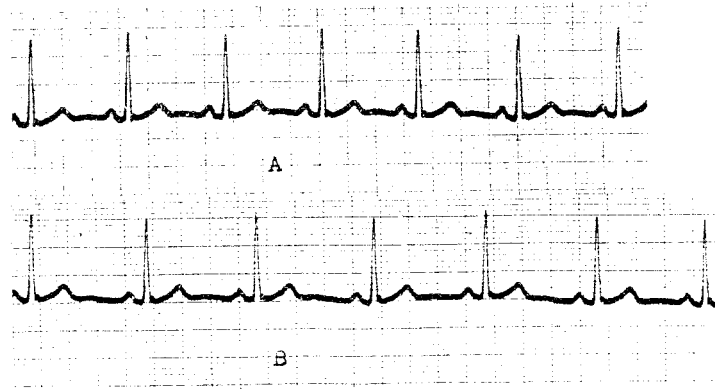


Fig.2 The ECG (1mv=10mm, 25mm=1sec.) of student W 1 showing a difference of T—P interval between (A) before penetration (B.P. 125/80mmHg, P.R. 73/min.) and (B) after penetration of point H7 (B.P. 122/80mmHg, P.R. 68/min.)

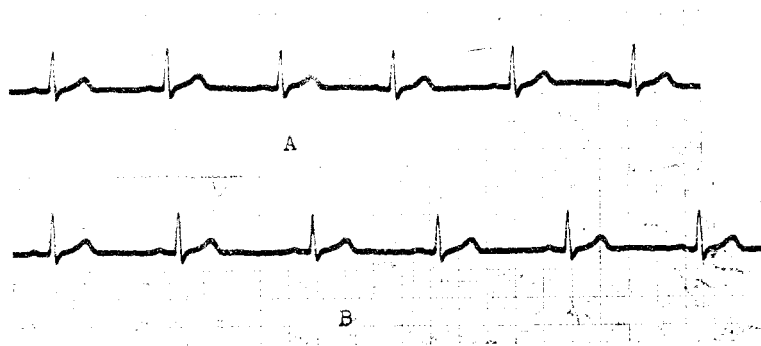


Fig.3 The ECG (1mv=10mm, 25mm=1sec.) of student S 1 showing a difference of T—P interval between (A) during penetration of single point Cx8 (B.P. 126/86mmHg, P.R. 70/min.) and (B) during penetration of combination points of Cx7 + Cx8 (B.P. 118/84mmHg, P.R. 64/min.)

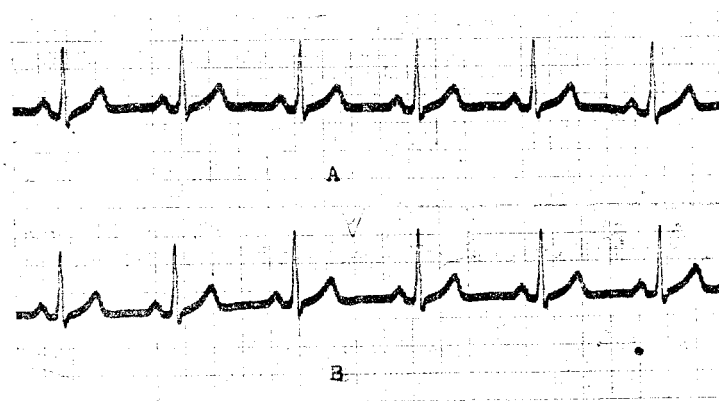


Fig.4 The ECG (1mv=10mm, 25mm=1sec.) of student Y1 showing no significant difference between (A) before penetration (B.P. 128/80mmHg, P.R. 69/min.) and (B) during penetration of nonsite point (B.P. 125/80mmHg, P.R. 70/min.).

Table 1 The change in percentage average of T wave , T—P interval , and R—R interval (cardiac cycle) during penetration.

Meridian points	Total No. of wave penet. (+)	T (+)	T—P inter. (+)	R—R inter							
				Average Increase (+)		Decrease		No change			
				No. of penet.	%	No. of penet.	%	No. of penet.	%		
B11(Dazhu)	14	7.5	53.4	14.6	10	71.4	2	14.3	2	14.3	
B12(Fengmen)	12	8.0	16.6	4.6	8	66.6	2	16.7	2	16.7	
B13(Feishu)	12	22.5	67.2	21.1	9	75.0	0	0	3	25.0	
B14(Zuyinshu)	15	15.0	22.2	2.8	9	60.0	6	40.0	0	0	
B15(Xinshu)	16	8.5	40.0	16.2	14	87.5	2	12.5	0	0	
B23(Shenshu)	13	2.6	50.9	20.0	12	92.3	0	0	1	7.7	
Cv12(Zhongwan)	14	9.7	10.0	10.1	10	71.4	2	14.3	2	14.3	
Cx6(Neiguan)	12	6.0	15.1	5.0	8	66.6	2	16.7	2	16.7	
Cx7(Daling)	15	7.3	30.1	16.9	11	73.3	3	20.0	1	6.7	
Cx8(Laogong)	16	5.3	20.8	15.0	12	75.4	2	12.3	2	12.3	
G20(Fengchi)	16	2.0	20.6	16.8	12	75.5	4	24.5	0	0	
G21(Jianjing)	16	15.0	38.3	18.3	16	100.0	0	0	0	0	
G30(Huantiao)	15	12.8	54.4	19.7	15	100.0	0	0	0	0	
G34(Yanglingquan)	10	6.3	37.4	20.1	9	90.0	0	0	1	10.0	
H5(Tongli)	15	5.0	15.4	3.0	9	60.0	6	40.0	0	0	
H6(Yinsin)	12	5.0	20.0	5.0	6	50.0	3	25.0	3	25.0	
H7(Shenmen)	20	15.3	27.9	16.0	16	80.0	4	20.0	0	0	
Li4(Hegu)	14	13.3	19.6	10.7	9	64.2	4	28.6	1	7.2	
Li11(Quchi)	12	5.3	25.8	13.7	8	66.6	0	0	4	33.4	
Li42(Xiengjian)	11	12.7	21.8	11.1	7	63.6	3	27.2	1	9.2	
S36(Zusanli)	19	8.8	39.4	16.6	17	89.4	2	10.6	0	0	
S41(Jiexi)	14	2.0	41.4	16.2	12	85.7	2	14.3	0	0	
S44(Neiting)	13	1.3	30.0	12.2	11	84.6	1	7.7	1	7.7	
Sp6(Sanyinjiao)	12	12.8	5.5	5.2	6	50.0	6	50.0	0	0	
Sp10(Xuehai)	10	11.1	22.5	8.5	7	70.0	2	20.0	1	10.0	

Penet.:penetration.Inter.:interval.+ : increase.

Table 2 Comparison of the events of ECG recording before penetration and during penetration among 25 points and among 85 students.

		T wave	Q—T inter.	T—P inter.	R—R inter.
Increase	No. of penet.	16	4	21	24
	%	64	16	84	96
	No. of student	38	44	62	73
	%	44.7	51.7	72.9	85.8
Decrease	No. of penet.	1	1	0	0
	%	4	4	0	0
	No. of student	23	7	14	5
	%	27.1	8.1	16.4	5.8
No change	No. of penet.	8	20	4	1
	%	32	80	16	4
	No. of student	24	34	9	7
	%	28.2	40.2	10.7	8.4
Total	No. of penet.	25	25	25	25
	%	100	100	100	100
	No. of student	85	85	85	85
	%	100	100	100	100

Penet.: penetration. Inter.: interval.

Table 3 Comparison of the change of B.P. and P.R. between before penetration and after penetration among 85 students.

	Decrease		Increase		No change	
	No. of students	%	No. of students	%	No. of students	%
B.P.	65	76.4	16	18.7	4	4.9
P.R.	73	85.9	5	5.8	7	8.3

S 36) were effective to slow down pulse rate.

Discussion

Up to the present time, the fundamental study of acupuncture on ECG, B.P., and P.R. was quite few. Furthermore, the data obtained from other observers were

not complete (5, 6, 14, 15). It is undeniable that from the data of this report one can presume that the certain meridian points in the human body have surely had the close relations with the cardiovascular activity just as what said in chinese acupuncture books. According to the conventional ideas, the so-called meridian points are all

meant the superficial skin, actually, some points are situated under the skin, in the muscles between bones and sinews or in spaces between nerves and blood vessels (3, 12, 13, 17, 18). It is said that penetration may destroy the cell membrane of nerve cells or muscle cells and induce injury potentials. Therefore, the excited impulses conduct through nerves to brain stem and control cardio-vascular reflexes through autonomic nervous system; or affect cardiac metabolism via humoral system (15). Accordingly, the excitability of cardiac muscle change and thus affect ECG, B.P., and P.R.. However, this explanation is still unable to be satisfactory entirely, because the meridian points have relation with nerves or specific muscles, but are never the nerve or muscle fiber (13, 14, 18). Therefore, another explanation of "Spirit (Qi) and blood circulation" is also valued (12). The mechanism of acupuncture is to apply the conductive energy of meridians, transmitting the feeling to cerebral cortex to reduce the resistance of the meridian lines so that the disorder of visceral organs can be regulated.

It is shown from this report that the inhibited effect induced by penetration to cardio-vascular functions is greater than that of excited effect. From the fact that the result of non-site points were similar to that of before penetration, we can make sure that the effect of psychological factor was not important in this experiment. In conclusion, by penetration into the points related to the cardiovascular function, it can make an autonomic regulation to the human body, namely, it gives the physiological function a restoration from disorder into order; the quick or irregular cardiac cycle can become slow and regular; the hi-

gh blood pressure become low and the low blood pressure become high, showing a physiological homeostasis.

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摘 要

本研究選擇 25 點中國針灸書籍所記載與心臟血管活動有關之穴位，施針於 85 位醫學生，記錄其心電圖、血壓、及脈膊之變化，用以研究那些穴位對心臟血管活動較為有效。本實驗結果顯示有 12 點穴位效果較良好。施針於這些穴位時，有 85.9 % 的學生心動週期（心電圖 R—R 間距）延長，且較針刺前平均延長 15 % 以上，其增長均因 T—P 間距延長所致。在 85 人數中有 65 人試驗後其血壓降低。至於配穴施針效果，雖較單穴為佳，但並不呈代數和。這些效果，不外因針刺而引起有關之神經（或經絡）反射，而抑制心臟活動，心肌代謝作用降低，使整個心臟鬆弛，血管系阻力減低，而導致心動週期延長，脈膊減緩，血壓降低等結果。