Journal of Traditional and Complementary Medicine Vo1. 3, No. 2, pp. 119-125

Journal of Traditional and Complementary Medicine
Journal homepage http://www.jtcm.org

On the Hazard Caused by the Heat of Acupuncture Needles in Warm Needling (溫針Wēn Zhēn)

Tsung-Chieh Lee[1], Tsung-Lin Cheng[2], Wen-Jiuan Chen[1], Lun-Chien Lo[1,2]

[1]Department of Chinese Medicine, Changhua Christian Hospital, Taiwan.
[2]Department and Graduate Institute of Mathematics, National Changhua University of Education, Taiwan.

ABSTRACT

Due to its simplicity and convenience, acupuncture has become popular as a complementary therapy. In this Chinese medicine, doctors have to find the traditional meridian acupuncture points before puncturing the needles into them. Moxibustion (艾灸 Ài Jiǔ) is also an important part of the acupuncture remedy. Treatment by acupuncture can be classified roughly into two types – direct moxibustion and indirect moxibustion. Warm-needling acupuncture (溫針灸 Wēn Zhēn Jiǔ) is classified under the method of indirect moxibustion. In the present study, 10 standard stainless steel acupuncture needles with 10 pieces of cylinder-shaped moxa cone (艾柱 Ài Zhù) as the heat source of warm needles were used. In order to prevent the practitioners from getting burns, it is necessary to study the temperature changes in some designated parts of the needles. Two sizes, 0.6 g and 1.0 g, of moxa cones were used for comparison of the measured temperatures. The needles are typically divided into two parts – the handle part and the needle body. In our experiment, the temperatures of WNA at different parts of the needles were measured. The larger the size of moxa cone is, the longer is the burning time. Based on the observations we suggest that when 0.6 g moxa is used, the physicians should better pick out the needles around 9 min after ignition; however, while using the 1 g moxa, it might be safer to pick out the needles around 13 min after ignition.

Key words: Acupuncture, Burning time, Moxibustion (艾灸 Ài Jiǔ), Warm-needling (溫針 Wēn Zhēn)

INTRODUCTION

Acupuncture is one of the oldest and widely used medical treatments in China. It originated more than 2000 years ago. Due to its simplicity and convenience, acupuncture has become popular as a complementary therapy. In this Chinese medicine, doctors have to find the traditional meridian acupuncture points before the needle is punctured into those points. Because of the significant remedial effects, acupuncture has drawn a lot of attention from the western world over the past 30 years.[1-3] The World Health Organization also acknowledged the effect of the treatment.[4] Around 2002, there were 42 states in the United States that had established statutory licensure governing more than 14,000 acupuncture practitioners.[5] In the past decade, acupuncture had been widely practiced to treat various diseases.[6] Besides, moxibustion, which is an important auxiliary part of acupuncture, may enhance the effect of curing disease by conducting heat to certain points or areas on the surface of the body through regulation of the function of meridians and visceral organs.[7] Moxibustion is of two types – direct moxibustion and indirect moxibustion. When performing direct moxibustion, moxa sticks are burnt at acupuncture points on the skin. On the contrary, in indirect moxibustion, the moxa cone (艾柱 Ài Zhù) does not touch the skin and is burnt insulated, by some substance, against the skin. In Traditional Chinese Medicine, moxibustion is

Correspondence to:
Dr. Lun-Chien Lo, Department of Chinese Medicine, Changhua Christian Hospital, No. 135, Nanxiao St., Changhua City, Changhua County 500, Taiwan.
Tel: 886-4-7238595, ext. 4228; E-mail: 126478@cch.org.tw

DOI: 10.4103/2225-4110.110410

usually used for the patients with cold pattern such as rheumatic arthritis,[8] joint pain,[9,10] diarrhea,[11] or cold numbness limbs.

Warm-needling acupuncture (WNA; 溫針灸 Wēn Zhēn Jiǔ) is classified under the category of indirect moxibustion.[12] When practicing WNA, the moxa cone is firstly put on the tail of the needle, and is then lighted up in such a way that the heat of moxa will be transmitted through the punctured needle to the correspondent acupuncture point. However, in some unexpected situations, practitioners might get burns while removing the needles after treatment. In order to prevent the practitioners from getting burns, it is necessary to study the temperature changes in some designated parts of the needles. We conducted an experiment to record the temperatures in the designated portion of the needles at some predetermined time intervals. The extreme temperatures are outlined, and 95% confidence interval of the average temperatures in different portions at different time intervals is determined. According to the outcome of the statistical analysis, we may propose a warning suggestion for the practitioners conducting WNA. In section 2, the method of this study is described. Section 3 states the main results and the related statistical analysis results. Finally, the paper ends with a brief conclusion.

MATERIALS AND METHODS

In the experiment, two groups with 10 stainless steel needles (An Chi Handy Acupuncture Needle, ISO 13485) and 10 pieces of cylinder-shaped moxa [Figure 1] were used. In the first group, each moxa used in WNA had a weight of 0.6 g, and in the second group each moxa was enlarged with a weight of 1.0 g. The main ingredient of the moxa is dried mugwort (*Artemisia argyi*). The size, shape, and weight of the moxa (真尚久香粒) were designed according to the traditional literature; for example, the base of 0.6 g moxa had a diameter of 10 mm and the height of the moxa was 10 mm. The 1.0 g moxa had a diameter of 13 mm and the height of the moxa was 15 mm. The length of the needles was 1.5 inch 32 gauge, and the needles were divided into two parts – the handle and the needle body.

The needles were punctured into polystyrene plastics in good upright positions. The handles of the needles were surrounded by the moxa cylinders in the middle part [Figure 2]. The temperature was measured by Raytek infrared thermometer (produced by Raytek Corp., CA, USA). Ignition started at the lateral side of the moxa cones. There were 40 moxa cones used for each group. In order to estimate the mean and extreme temperatures in different parts of the needles, we measured for each needle the temperatures of the upper end of the handle, the lower end of the handle, the needle body above the polystyrene plastics, and the tip of the needle body, respectively. The distance between upper end of the handle and the moxa cone was 1.5 cm, between lower end of the handle and the moxa cone was also 1.5 cm, at the needle body above the polystyrene plastics was 2.0 cm, and between the tip of the needle body and the polystyrene plastics was also 2.0 cm. The temperatures were measured as the benchmark before ignition. The temperature and moisture of the laboratory were controlled to be stable. After lighting up, we began to record the temperatures at every designed time interval. The temperatures were recorded every 30 seconds after ignition.

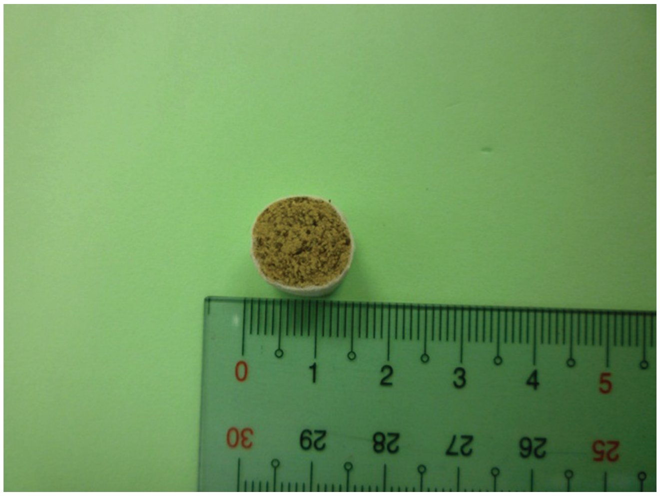

Figure 1. A standard moxa for warm acupuncture

RESULTS

The figures and tables given in Appendix illustrate the changes in temperature recorded every 30 seconds in each of the four designated parts of a needle. The experimental results show the hazardous time and positions when conducting a warm acupuncture (溫針 Wēn Zhēn). The extreme (maximal) temperature at each recording time is especially important as it might cause danger. The extreme values can be provided as a warning notice when there are practiced. Eight groups of warming needles were observed and are categorized in Table 1.

Table 1. Eight groups of warming needles

Weight of moxa (g)	Measured points			
	The upper end of the handle	The lower end of the handle	The needle body above the polystyrene plastics	The tip of the needle body
0.6	1a	2a	3a	4a
1	1b	2b	3b	4b

The tables and figures and giving the temperatures of the warming needles are shown in Appendix

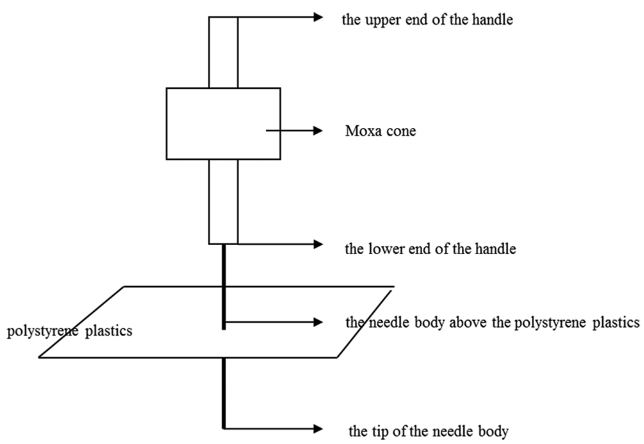

Figure 2. The four designated parts of a warm needle

From Tables A1 and A2, it seems that the highest temperature occurs around 4′30″ or 5′30″ from ignition. The two tables summarize the mean temperatures of the warm needles using 0.6 g moxa. In particular, Table A2 shows the highest temperatures at the designated parts of the needles. In Group 1a (temperatures taken at the upper end of the handle), the highest temperature may reach 344°C and it still remains 45°C at 9 min 30 seconds. In Group 2a (temperatures taken at the lower end of the handle), the temperatures are lower than those in Group 1a. Note that in Group 2a, the highest temperature may reach 320°C at 5 min 30 seconds. In Group 3a (temperatures taken at the needle body above the polystyrene plastic), the temperatures are lower than those in groups 1a and 2a. Note that the highest temperature in Group 3a is only 66.4°C. The temperatures recorded in Group 4a are around 25°C, which are safer.

Tables A3 and A4 show the temperatures of the warming needles using 1 g moxa. The highest temperature (375°C) in Group 1b is 31°C higher than that (344°C) in Group 1a. The highest temperatures in groups 2b and 2a are around 310°C. Because the moxa used in Group b is more than in Group a, the required cooling time also gets prolonged. It takes almost 15 min for the needles to cool down to the temperature before ignition. The other three groups do not show much variation.

The time series plots of the temperatures recorded in Group a are shown in Figures A1a to A4a, while those in Group b are illustrated in Figures A1b to A4b. We depict a 95% confidence band for the varying temperatures.

DISCUSSION

Three possible ways of heat conduction are transmission, radiation, and convection. If the effects of energy transmission were via the needles, the bodies of the needles should not have lower temperatures as suggested by the present study. A possible explanation for the remedial effect of WNA may be due to radiation or convection. While some researchers suggested that the therapeutic effect of moxibustion is correlated with the temperature, some others have shown that infrared irradiation might have the same effect.[13] There are also some studies suggesting that indirect heating may be a possible effect of moxa.

Besides, moxa plays an interesting role in the therapy. Lin[14] suggested that the effect of moxibustion is highly associated with thermal as well as the pharmacological reaction of the materials used.

The treatment effects of moxibustion are not only induced by heat but also by its chemical function. Also, a study shows the safety of pH level, heavy metals, and UV absorbance spectrum on the cytotoxicity and hemolysis of the needle.[15] The radical scavenging effect of moxa or moxa-tar is measured by a chemical reaction with 1,1-diphenyl-2-picrylhydrazyl. The inhibitor effects of moxa or moxa-tar on superoxide production are caused by the radical scavenging mechanism.[16] As the above references suggest, the chemical ingredients of moxa play an important role in the therapeutic effect.[17]

In the present study, the main difficulties arose when we measured the temperatures of four designated parts of a warming needle. There are some studies observing the temperature changes in the human body during the burning of moxa ball. But they did not check needle tip temperature.[18] Since it is impossible to measure the temperatures of the needles punctured into patients, we designed an experiment to mimic the real situations. In TCM, WNA is an efficient way for the patients with "cold pattern." Traditional Chinese physicians believed that WNA can transmit heat to the meridian acupuncture points of the patients. However, when the physicians remove the needles from the patients, they might suffer burns. So far, there is no related study on the possible hazardous time when conducting WNA. For the sake of medical safety, it is necessary to investigate the proper time at which the needles can be removed from the patients. When conducting acupuncture, the handle of the needles is frequently touched. In the present study, no matter which moxa we used, the most hazardous part of a warming needle is around the handle. Larger the moxa size, longer is the time required for cooling. Fortunately, when conducting WNA, the other parts of a needle do not cause burns. When the weight of a moxa increases from 0.6 to 1 g, the temperature of the warming needle also increases and the required cooling time also gets prolonged. We suggest that a safer timing for a TCM physician to remove the needles should not be earlier than 9′30″ (resp. 13′30″) for a 0.6 g moxa (resp. 1 g moxa) as the heat source. Since mugwort in this study has been made of the moxa cone, the study investigates the routine use of moxa cone and the burning time, in order to avoid the practitioner suffering from burns. Future studies could focus on the influence of the production process of *A. argyi* leaves.

ACKNOWLEDGMENT

Department of Chinese Medicine, Changhua Christian Hospital, Changhua, Taiwan is acknowledged for the research funding provided.

REFERENCES

1. Ezzo J, Vickers A, Richardson MA, Allen C, Dibble SL, Issell B, *et al*. Acupuncture-point stimulation for chemotherapy-induced nausea and vomiting. J Clin Oncol 2005;23:7188-98.
2. Mukaino Y, Park J, White A, Ernst E. The effectiveness of acupuncture for depression: A systematic review of randomised controlled trials. Acupunct Med 2005;23:70-6.
3. Tukmachi E, Jubb R, Dempsey E, Jones P. The effect of acupuncture on the symptoms of knee osteoarthritis: An open randomised controlled study. Acupunct Med 2004;22:14-22.
4. WHO Regional Office for the Western Pacific 2007. p. 356.
5. Burcham MR. Credentialing alternative medicine: A new challenge for managed care organizations. Manag Care Q 1999;7:39-42.
6. Ammendolia C, Furlan AD, Imamura M, Irvin E, van Tulder M. Evidence-informed management of chronic low back pain with needle acupuncture. Spine J 2008;8:160-72.
7. Li X, Hu J, Wang X, Zhang H, Liu J. Moxibustion and other acupuncture point stimulation methods to treat breech presentation: A systematic review of clinical trials. Chin Med 2009;4:4.
8. Sun L. Clinical observation on 434 cases of rheumatoid arthritis treated by moxibustion with warming needle. Zhen Ci Yan Jiu 1992;17:249-51.
9. Vas J, Perea-Milla E, Mendez C. Acupuncture and moxibustion as an adjunctive treatment for osteoarthritis of the knee: A large case series. Acupunct Med 2004;22:23-8.
10. Uryu N, Okada K, Kawakita K. Analgesic effects of indirect moxibustion on an experimental rat model of osteoarthritis in the knee. Acupunct Med 2007;25:175-83.

11. Joos S, Wildau N, Kohnen R, Szecsenyi J, Schuppan D, Willich SN, *et al*. Acupuncture and moxibustion in the treatment of ulcerative colitis: A randomized controlled study. Scand J Gastroenterol 2006;41:1056-63.
12. Tsui ML, Cheing GL. The effectiveness of electroacupuncture versus electrical heat acupuncture in the management of chronic low-back pain. J Altern Complement Med 2004;10:803-9.
13. Pach D, Brinkhaus B, Willich SN. Moxa sticks: Thermal properties and possible implications for clinical trials. Complement Ther Med 2009;17:243-6.
14. Lin WZ. Experimental acupuncture and moxibustion. Shanghai: Publishing House of Shanghai Science and Technology; 1994. p. 58-63.
15. Zheng JJ, Shen XY, Zhao Y. Characteristics of infrared radiation of meridians and acupoints. Zhongguo Zhen Jiu 2010;30:831-4.
16. Chiba A, Nakanishi H, Chichibu S. Thermal and antiradical properties of indirect moxibustion. Am J Chin Med 1997;25:281-7.
17. Shen X, Ding G, Wei J, Zhao L, Zhou Y, Deng H, *et al*. An infrared radiation study of the biophysical characteristics of traditional moxibustion. Complement Ther Med 2006;14:213-9.
18. Zhao Y, Qin Y, Zheng JJ, An GH, Cheng K, Zhao L, *et al*. Discussion on the temperature characteristic of silver needle in the human body during the warm needling. Zhongguo Zhen Jiu 2012;32:803-6.

APPENDIX

Table A1. The means and standard deviations (mean±SD) of the temperatures taken in different parts of the needles for group a (0.6 g moxa)

Time (min)	The upper end of the handle (Group 1a)	The lower end of the handle (Group 2a)	The needle body above the polystyrene plastic (Group 3a)	The tip of the needle body (Group 4a)
Average weight	0.59±0.054	0.578±0.03	0.598±0.042	0.586±0.034
Average room temperature (°C)	24.42±1.425	25.2±0.685	25.04±0.572	24.26±0.425
Average moisture	62.21±0.761	60.64±5.946	60.29±6.121	65.77±1.874
Baseline temperature (°C)	24.65±1.209	25.63±0.508	25.4±0.627	24.67±0.389
30″	39.53±5.844	38.2±5.737	26±0.868	24.87±0.316
1′30″	66.41±15.96	64.05±12.88	28.99±2.24	25±0.359
2′30″	128.9±33.26	125.2±30.52	33.64±3.649	25.46±0.337
3′30″	205.8±46.55	193.5±37.86	39.65±6.039	25.75±0.246
4′30″	273±49.6	251.7±40.03	43.24±8.829	26.16±0.35
5′30″	290.5±33.13	267.6±28.49	40.15±7.881	25.89±0.401
6′30″	243±66.96	209.7±72.3	36.52±8.235	25.42±0.301
7′30″	141.5±99.12	104.4±72.5	31.67±6.43	25.06±0.263
8′30″	58.45±39.38	42.61±16.55	27.75±2.09	24.83±0.211
9′30″	31.09±7.057	29.61±3.303	26.38±0.991	24.75±0.246

Table A2. The highest temperature of the needle at different time intervals (0.6 g moxa)

Time (min)	The upper end of the handle (Group 1a)	The lower end of the handle (Group 2a)	The needle body above the polystyrene plastic (Group 3a)	The tip of the needle body (Group 4a)
Baseline temperature (°C)	25. 9	26. 2	26. 2	25.2
30″	49.9	48.9	27.7	25.2
1′30″	101.1	91.7	32.7	25.4
2′30″	187	181.5	40.8	26.1
3′30″	300	263	53.2	26.2
4′30″	344	308	66.4	26.6
5′30″	330	320	61.8	26.2
6′30″	327	300	58.9	25.7
7′30″	291	247	49.3	25.4
8′30″	141.6	76.6	33	25.1
9′30″	45	36.2	28.5	25.1

Table A3. The means and standard deviations (mean±SD) of the temperatures taken in different parts of the needles for group b (1.0 g moxa)

Time (min)	The upper end of the handle (Group 1b)	The lower end of the handle (Group 2b)	The needle body above the polystyrene plastic (Group 3b)	The tip of the needle body (Group 4b)
Average weight	1.06±0.028	1.08±0.05	1.05±0.04	1.05±0.04
Average room temperature (°C)	25.07±1.06	24.98±0.91	25.48±0.76	25.09±1.08
Average moisture	64.12±4.36	64.29±2.82	65.6±2.55	64.43±2.66
Baseline temperature (°C)	25.35±0.93	25.14±0.96	25.78±0.57	26.01±0.61
30″	37.2±6.75	29.52±3.29	28.83±1.12	26.13±0.56
1′30″	54.39±17.29	39.74±6.74	33.32±2.37	26.39±0.63
2′30″	78.72±26.71	58.21±15.34	41.86±5.33	26.8±0.65
3′30″	134.98±41.74	93.16±31.32	52.91±11.2	26.96±0.75
4′30″	179.13±40.1	137.46±44.12	65.07±16.12	27.23±0.79
5′30″	245.75±39.45	183.1±50.06	80.46±18.46	27.57±0.82
6′30″	279.2±40.43	222.96±48.97	84.35±19.8	27.51±1.04
7′30″	296.7±49.77	244.84±43.58	80.86±20.13	27.24±1.07
8′30″	284.87±56.25	241.61±47.94	74.46±17.39	26.88±1.02
9′30″	218.32±86.75	214.92±58.54	57.99±16.36	26.4±0.94
10′30″	125.18±97.71	134±81.61	40.45±15.02	26.08±0.85
11′30″	65.65±65.03	77.35±79.48	31.18±7.48	25.88±0.76
12′30″	31.41±8.01	41.23±32.6	27.47±1.84	25.73±0.774
13′30″	27.05±2.66	28.8±5.3	26.55±1.06	25.68±0.78
14′30″	25.95±1.41	26.57±1.88	26.23±0.88	25.64±0.82

Table A4. The highest temperature of the needle at different time intervals (1.0 g moxa)

Time (min)	The upper end of the handle (Group 1b)	The lower end of the handle (Group 2b)	The needle body above the polystyrene plastic (Group 3b)	The tip of the needle body (Group 4b)
Baseline temperature (°C)	26.7	26.4	26.3	26.7
30″	48.7	34.5	30.8	26.8
1′30″	79.6	53.1	36.1	27.1
2′30″	127.8	88.7	46.5	27.6
3′30″	193.7	154.2	73.1	27.9
4′30″	250	231	93.2	28.2
5′30″	285	240	111.6	28.6
6′30″	316	276	111.8	29
7′30″	366	290	105.8	29.1
8′30″	375	306	92.6	28.3
9′30″	357	296	82	27.8
10′30″	326	276	56.9	27.4
11′30″	160.5	202	51.2	27.1
12′30″	48.4	132.1	31.4	27
13′30″	33.9	42.8	27.6	26.9
14′30″	29.5	30.9	27.1	27

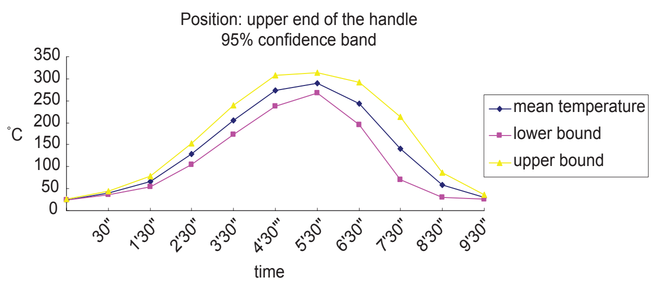

Figure A1a. Time series plot of the temperatures measured at the upper end of the handle (using 0.6 g moxa)

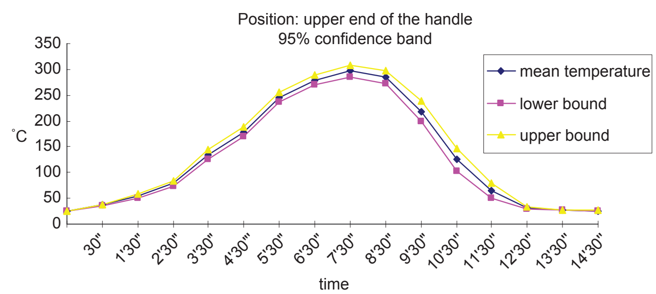

Figure A1b. Time series plot of the temperatures measured at the upper end of the handle (using 1.0 g moxa)

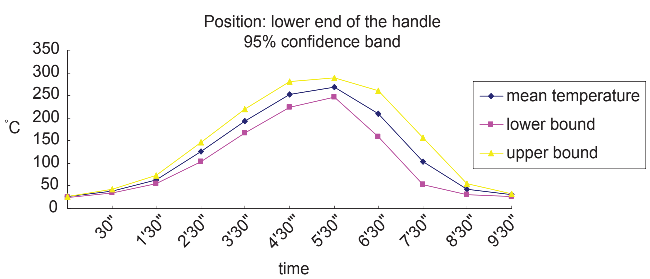

Figure A2a. Time series plot of the temperatures measured at the lower end of the handle (using 0.6 g moxa)

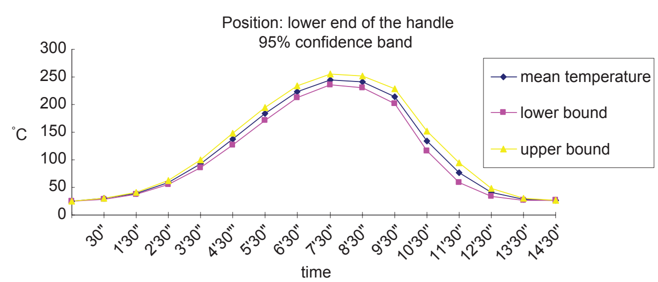

Figure A2b. Time series plot of the temperatures measured at the lower end of the handle (using 1.0 g moxa)

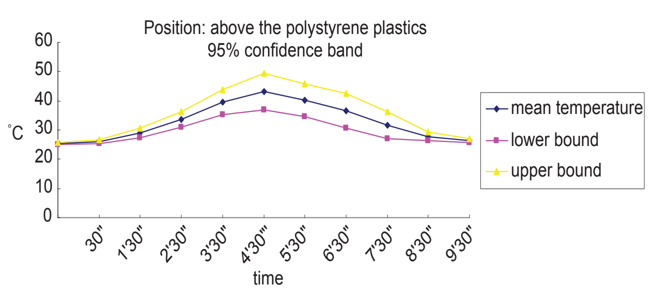

Figure A3a. Time series plot of the temperatures measured at the needle body above the polystyrene plastic (using 0.6 g moxa)

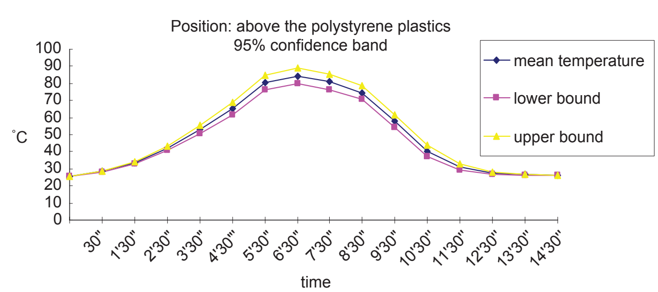

Figure A3b. Time series plot of the temperatures measured at the needle body above the polystyrene plastic (using 1.0 g moxa)

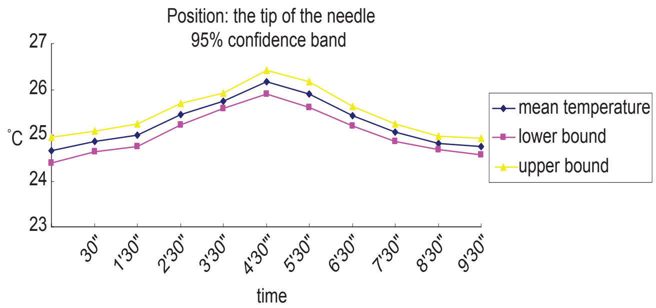

Figure A4a. Time series plot of the temperatures measured at the tip of the needle (using 0.6 g moxa)

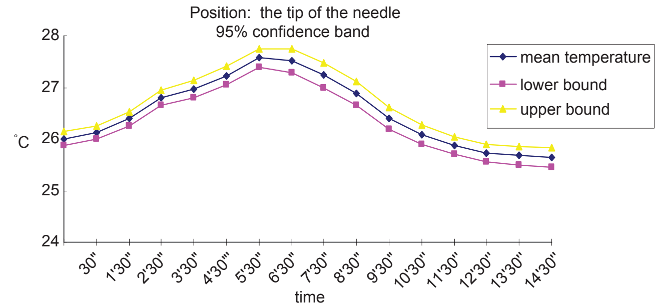

Figure A4b. Time series plot of the temperatures measured at the tip of the needle (using 1.0 g moxa)