

# Auricular point sticking for relieving pain in arteriovenous fistula puncture

## 耳穴贴压缓解动静脉内瘘血管穿刺疼痛的研究

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### Abstract

**Objective:** To observe the clinical efficacy of auricular point sticking at different points to relieve the pain in arteriovenous fistula puncture.

**Methods:** A total of 42 patients with arteriovenous fistula were randomized into a Shenmen (TF<sub>4</sub>) group and an Elbow (SF<sub>3</sub>) group by the random number table method, with 21 cases in each group. After enrolled into different groups, before the dialysis, patients were given auricular point sticking with *Wang Bu Liu Xing* (*Semen Vaccariae*) seeds at Shenmen (TF<sub>4</sub>) and Elbow (SF<sub>3</sub>), respectively. Patients were asked to press the seeds themselves for 2 min each time, four times a day, and an additional 5-15 min before the arteriovenous fistula puncture. Intensive pressing was offered during the puncture, 15-20 presses for each time, and the plasters were changed every 2-3 d. The numerical rating scale (NRS) was used to score the pain level one week before and after auricular point sticking. The NRS score was then compared and analyzed.

**Results:** The intra-group comparison showed that the changes of NRS score in both groups were statistically significant after auricular point sticking (both  $P < 0.05$ ). After the treatment, there was no significant difference in NRS score between the two groups ( $P > 0.05$ ).

**Conclusion:** Auricular point sticking at Shenmen (TF<sub>4</sub>) or Elbow (SF<sub>3</sub>) can effectively relieve the pain of arteriovenous fistula puncture, and these two points have equivalent analgesic effect.

**Keywords:** Auricular Point Sticking; Otopoint, Elbow (SF<sub>3</sub>); Otopoint, Shenmen (TF<sub>4</sub>); Arteriovenous Fistula; Pain Measurement; Hemodialysis

**【摘要】目的:** 观察耳穴贴压不同穴位缓解动静脉内瘘血管穿刺疼痛的疗效。**方法:** 采用随机数字表法将 42 例动静脉内瘘患者分为神门穴组和肘穴组, 每组 21 例, 于入组后透析前分别将王不留行籽贴压于耳神门穴和肘穴。患者每日自行按压 4 次, 每次按压 2 min, 并于动静脉内瘘血管穿刺前 5-15 min 增加按压 1 次, 穿刺同时加强按压, 每次按压 15-20 次, 2-3 天更换 1 次。使用数字评定量表(NRS)记录每例患者耳穴贴压前 1 周内和耳穴贴压后 1 周内的疼痛评分, 并对 NRS 评分进行比较分析。**结果:** 组内比较, 耳穴贴压后两组 NRS 评分变化均有统计学意义(均  $P < 0.05$ )。治疗后, 两组 NRS 评分无统计学差异( $P > 0.05$ )。**结论:** 耳穴贴压神门穴或肘穴均能有效减轻动静脉内瘘血管穿刺疼痛; 神门穴与肘穴的镇痛效果相当。

**【关键词】** 耳穴贴压; 耳穴, 肘; 耳穴, 神门; 动静脉内瘘; 疼痛测评; 血液透析

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Vascular access is necessary for hemodialysis treatment, and arteriovenous fistula (AVF) has the advantages of high patency rate, fewer complications, low cost and low mortality<sup>[1-2]</sup>. It is the preferred long-term hemodialysis vascular access recommended by the *Dialysis Outcome Quality Initiative* (DOQI), and accounts for more than 90% of the vascular access in patients undergoing maintenance hemodialysis in China<sup>[3]</sup>. Hemodialysis patients need to receive more

than 300 punctures per year on average. These patients not only endure the pain caused by the disease, but also bear the fear and anxiety caused by the puncture. Auricular point sticking can obviously relieve anxiety<sup>[4]</sup>, and it has a good effect on postoperative pain, especially for postoperative pain caused by arteriovenous fistula<sup>[5-7]</sup>. To explore the analgesic effect of auricular point sticking for vascular puncture in arteriovenous fistula and to compare the analgesic effect of pressing at different auricular points, we selected 42 dialysis patients from the Blood Purification Center, Hangzhou Hospital of Traditional Chinese Medicine to receive auricular point sticking treatment, and compared the analgesic effect of Shenmen (TF<sub>4</sub>) and Elbow (SF<sub>3</sub>).

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## 1 Clinical Materials

### 1.1 Inclusion criteria

Those aged 18-80 years old; whose vascular access was autologous arteriovenous fistula; no complications such as inflammation, skin lesion, bleeding or hematoma at the puncture site; with clear consciousness, normal intelligence, no history of psychiatric disorder or drug dependence, and were able to comply with the trial independently; no eczema, inflammation, ulcers or frostbite on the auricle; agreed to receive auricular point sticking treatment and signed informed consent.

### 1.2 Exclusion criteria

Those with skin allodynia; those who were taking anesthetics, analgesics or anti-anxiety drugs; allergic to auricular point sticking; allergic to tape.

### 1.3 Statistical method

All data were statistically analyzed by SPSS statistics 17.0. Measurement data in normal distribution were expressed as mean  $\pm$  standard deviation ( $\bar{x} \pm s$ ), and *t*-test was applied for the comparison between groups.

Intra-group data at different time points were compared by repeated measures analysis of variance. Data in non-normal distribution were expressed as mean (P25, P75) [M (P25, P75)], and rank sum test was applied for the comparison between groups. Counting data were expressed as frequency and percentage, and the comparison between groups was processed by Chi-square test. The rank sum test was used for the comparison of ranked data between groups. *P*<0.05 was considered to indicate a statistically significant difference.

### 1.4 General data

A total of 42 dialysis patients were enrolled from the Blood Purification Center, Hangzhou Hospital of Traditional Chinese Medicine between March 2017 and June 2017. All patients were randomized into a Shenmen (TF<sub>4</sub>) group and an Elbow (SF<sub>3</sub>) group by the random number table method, with 21 cases in each group. There were no statistically significant differences in the general data between the two groups (*P*>0.05), (Table 1).

**Table 1. Comparison of the general data between the two groups**

Group	Gender (case)		Average age ( $\bar{x} \pm s$ , year)	Dialysis time [M (P25, P75), month]	Education (case)		Primary disease (case)			
	<i>n</i>	Male			Female	Junior high and below	Above junior high	Chronic glomerulonephritis	Diabetic nephropathy	IgA nephropathy
Shenme (TF <sub>4</sub> )	21	7	14	50.6 $\pm$ 15.6	25.0 (4.0, 95.0)	8	13	16	4	1
Elbow (SF <sub>3</sub> )	21	11	10	49.8 $\pm$ 13.3	16.5 (2.0, 90.0)	9	12	17	3	1
Statistic value		-1.241 <sup>1)</sup>	0.173 <sup>2)</sup>	1.593 <sup>3)</sup>		0.312 <sup>1)</sup>			-0.253 <sup>1)</sup>	
<i>P</i> -value		0.222	0.871	0.121		0.764			0.802	

Note: 1)  $\chi^2$ -value; 2) *t*-value; 3) *Z*-value

## 2 Treatment Methods

The Nipro 16G disposable arteriovenous fistula needle (Nipro, Japan) was used to perform arteriovenous fistula puncture by the one same nursing staff in our hemodialysis center. The auricular points were located by electronic detector. Patients in both groups received auricular point sticking before dialysis.

### 2.1 Shenmen (TF<sub>4</sub>) group

Otopoint: Shenmen (TF<sub>4</sub>).

Methods: Shenmen (TF<sub>4</sub>) on the same side of arteriovenous fistula was selected. The physician held the back of the patient's ear with the left hand and held the probe with the right hand to find the tender and sensitive points near Shenmen (TF<sub>4</sub>) with even and gentle pressure. After disinfection of the auricle surface by 75% alcohol, the auricular point was precisely pressed with *Wang Bu Liu Xing* (*Semen Vaccariae*) seed using adhesive plaster. Patients were asked to press the seed themselves for 2 min each time, 4 times a day, and once more 5-15 min before the arteriovenous fistula

puncture. The pressing should be strengthened during the puncture, 15-20 presses for each time, and the plasters were changed every 2-3 d.

Cautions: Pressure should not be too heavy. It was better to feel mild pain or soreness. Rubbing should be avoided. The *Wang Bu Liu Xing* (*Semen Vaccariae*) seed should be replaced in time if moistened and fell off<sup>[8]</sup>.

### 2.2 Elbow (SF<sub>3</sub>) group

Otopoint: Elbow (SF<sub>3</sub>).

Methods: Elbow (SF<sub>3</sub>) on the same side of arteriovenous fistula was selected. Sticking methods were the same as those in the Shenmen (TF<sub>4</sub>) group.

Cautions: Same as those in the Shenmen (TF<sub>4</sub>) group.

## 3 Observation of Efficacy

### 3.1 Observation items

The numerical rating scale (NRS) was used to assess the degree of pain. The score of puncture pain was recorded one week before auricular point sticking treatment of each patient after grouping. The degree of

pain during puncture was scored and recorded after each successful puncture. And the scores of puncture pain were recorded for one week (3 times) after auricular point sticking treatment.

NRS was a self-rating pain intensity assessment tool<sup>[9]</sup>. The degree of pain was represented by a total of 11 numbers from 0 to 10. The patients chose the number that represented the pain level themselves. Pain grading standards: 0 was painless; 1 to 3 was mild pain, that was, a little pain without affecting sleep; 4 to 6 was moderate pain, that was, obvious pain that slightly affected sleep; 7 to 10 was severe pain, that was, the pain was severe, or obviously affected sleep.

### 3.2 Results

#### 3.2.1 Comparison of degree of puncture pain before and after auricular point sticking treatment

The degree of puncture pain of the 42 patients before and after auricular point sticking was compared, and it was found that the pain degree was moderate to

severe before auricular point sticking but reduced after the intervention, and no severe pain occurred (Table 2). The average score of NRS before auricular point sticking was (6.05±0.85) points of the 42 patients, versus (3.54±0.65) points after auricular point sticking, and the difference was statistically significant ( $P<0.05$ ). It is indicated that auricular point sticking at Shenmen (TF<sub>4</sub>) or Elbow (SF<sub>3</sub>) could effectively reduce the pain in arteriovenous fistula puncture.

#### 3.2.2 Comparison of NRS score between the two groups

The results of repeated measures analysis of variance showed that the NRS scores of the two groups were significantly lower than those before auricular point sticking, and the NRS scores gradually decreased with the prolongation of the sticking time, and the time effect was statistically significant ( $P<0.05$ ), while grouping and interaction effect did not significantly affect the score (all  $P>0.05$ ), (Table 3).

**Table 2. Comparison of puncture pain before and after auricular point sticking treatment**

Time	<i>n</i>	Mild	Moderate	Severe	Z-value	P-value
Before auricular point sticking	42	0	26	16	-5.712	0.000
After auricular point sticking	42	17	25	0		

**Table 3. Comparison of NRS score between the two groups one week before and after intervention ( $\bar{x} \pm s$ , point)**

Group	<i>n</i>	Before intervention	2 d after intervention	4 d after intervention	6 d after intervention	$F_{time}$	$P_{time}$	$F_{grouping}$	$P_{grouping}$	$F_{interaction}$	$P_{interaction}$
Shenmen (TF <sub>4</sub> )	21	6.05±0.98	3.81±0.68	3.43±0.87	2.95±0.74	233.732	0.000	0.161	0.694	0.483	0.692
Elbow (SF <sub>3</sub> )	21	5.97±0.72	3.90±0.70	3.67±1.02	3.00±0.84						
<i>t</i> -value		0.239	-0.568	-0.894	-0.756						
<i>P</i> -value		0.814	0.576	0.382	0.356						

## 4 Discussion

Although the pain duration from arteriovenous fistula puncture in patients undergoing maintenance hemodialysis is short, repeated puncture pains of 2-3 times per week still have a serious impact on the patients' physical and mental health<sup>[10]</sup>. Relevant literature believes that arteriovenous fistula puncture pain increases the patients' anxiety and tension, and the more severe the anxiety and tension, the lower the pain threshold of the body, the stronger the pain<sup>[11]</sup>. Wu XQ, *et al*<sup>[12]</sup> used lidocaine as local anesthesia to reduce the pain of arteriovenous fistula puncture in hemodialysis, but the effect was relatively slow and cost much, and the differences among different individuals were significant, with certain adverse reactions<sup>[13-14]</sup>. Auricular point sticking is a method to treat diseases by

sticking pills, seeds or magnetic beads onto auricular points, pressing and stimulating corresponding points or reaction points with fingers, thereby preventing and treating diseases<sup>[15]</sup>.

Traditional Chinese medicine believes that pain occurs when pathogenic factors attack meridians and cause qi and blood to stagnate. The twelve meridians are directly or indirectly related to the ear. Stimulating the auricular points can cause corresponding transmission of sensation along the meridians, thereby regulating the function of Zang-fu organs<sup>[16]</sup>. According to the theory of Western medicine, the nerve distribution of the auricle is very rich. By stimulating the corresponding parts of the auricle, the transmission of pathological impulses of neurons can be blocked, and then the symptoms of the disease can be relieved or eliminated.

In this study, Shenmen (TF<sub>4</sub>) and Elbow (SF<sub>3</sub>) were selected. Shenmen (TF<sub>4</sub>) is a key ear point for tranquilization, mainly used to treat nervous system disorders such as dysphoria, anxiety, neurasthenia, and relieve various kinds of pain<sup>[17-18]</sup>. Elbow (SF<sub>3</sub>) is a sleep-inducing point, and it has the spasmolytic effect and is mainly used to treat elbow pain. The results of this study indicated that auricular point sticking at Shenmen (TF<sub>4</sub>) and Elbow (SF<sub>3</sub>) could effectively reduce the pain during arteriovenous fistula puncture, which was in line with the previous reports<sup>[19-20]</sup>. Shenmen (TF<sub>4</sub>) can reduce the degree of puncture pain by sedation. Arteriovenous fistula in hemodialysis patients is usually preferred for anastomosis of the radial artery and cephalic vein of the forearm near the wrist<sup>[21]</sup>. The location is consistent with the target of Elbow (SF<sub>3</sub>).

Meanwhile, the results in this study showed that NRS scores in both groups decreased significantly after one week of auricular point sticking and the scores constantly decreased with the intervention time prolonged, indicating that the longer the time of auricular point sticking, the better the analgesia effect, which might be related with the increase in acupoint stimulation. Chen H, *et al*<sup>[22]</sup> believe that the effect of acupoints is closely related to the tissue morphology of acupoints, the degree and the time of stimulation. Other report also holds that given sufficient stimulation, even the acupoints with a low pain threshold can also produce satisfactory efficacy, with no specificity<sup>[23]</sup>. In this study, there was no statistical difference in time effect of Shenmen (TF<sub>4</sub>) and Elbow (SF<sub>3</sub>) on relieving pain of arteriovenous fistula puncture ( $P>0.05$ ), suggesting that the two auricular points had equivalent analgesic effect.

The traditional concept of analgesia believes that drugs for analgesia can be used when patients suffer from severe pain. Nowadays, the principle of standardized pain management and analgesia treatment is advocated to effectively relieve the pain, at the same time, maximize the physical function and quality of life of the patients, and reduce drug use and the cost of treatment. Good pain management is beneficial to the prognosis of patients and improvement of quality of life<sup>[24]</sup>.

Results in this study suggested that auricular point sticking at Shenmen (TF<sub>4</sub>) or Elbow (SF<sub>3</sub>) could reduce the pain in arteriovenous fistula puncture, with the advantages of simple operation, fewer adverse reactions and low cost, and is worthy of clinical promotion and application. However, the sample size was small and the observation was short in this study. The sample size should be increased, and the intervention time of auricular point sticking should be prolonged for further in-depth study in the future.

#### Conflict of Interest

The authors declared that there was no potential conflict of interest in this article.

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#### Statement of Informed Consent

Informed consent was obtained from the patients in this study.

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