

Effects of Aroma Inhalation on Blood Pressure, Pulse, Visual Analog Scale, and McNair Scale in Nursing Students Practicing Intravenous Injection at the First Time

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Abstract

Objectives: The purpose of this study was to identify the effects of aromatherapy on an anxiety of nursing students at the first time practice about intravenous injection. To learn intravenous injection skill is one of the most stressful situations for the nursing students. We expected that aromatherapy used as nursing intervention will be helpful to decrease their anxiety. **Method:** Subjects of this study were fifty-five nursing students who attended in fundamental of nursing class. The experiment and data collection were conducted on May 25, 2010. Anxiety was measured by five variables, systolic and diastolic blood pressure, pulse, McNair's tension-anxiety scale, and VAS for anxiety. Treatment of this study was aroma lamp inhalation using lavender, chamomile, and sweet-orange essential oil. Data were analyzed using PASW. **Results:** There were significant differences in pulse between experimental and control groups just before practice. And degree of increase in systolic blood pressure and pulse rate were significantly low in the experimental group. **Conclusions:** Aroma lamp inhalation, an easy to use intervention was useful to decrease anxiety in practice of intravenous injection.

Keywords: Aromatherapy, Nursing student, Anxiety

1. Introduction

Nursing is a field of study combining theories and practices. Nursing students learn basic nursing skills along with knowledge, especially in the fundamental nursing class. Practicing the fundamental of nursing, they often face unfamiliar and stressful procedures. At this time, these procedures can provoke high-level psychological difficulties and they lead the students' ineffective learning and negatively nursing activities. In particular, injection is an area producing the most serious psychological burden of the basic nursing skills [1] and it is known to lead to more anxiety than other practices.

Anxiety is an emotional reaction to an unspecific risk which cannot be perceived consciously and includes tension, worry and fear [2]. While a generally fair level of anxiety makes a person adapt to a circumstance by awakening them, an excessive and continuous anxiety can result in maladjustment by reducing one's ability to cope with a certain circumstance [3].

These days complementary and alternative medicine has drawn attention in health care fields. It has tried to prove its effects scientifically and out of them aromatherapy is known to decline anxiety and to relieve stress. [4,5]. Aromatherapy is a therapy to promote physical, mental and psychological health, to maintain health and to enhance vitality with therapeutic

components of refined essential oil extracted from various plants. It can be provided through massage, inhalation, local application, wet pack, sitz-bath and bath and especially massage and inhalation have been widely used as nursing interventions [6,7]. Aroma inhalation is effective for mental and physical stability, refreshing and concentration as an essential oil is absorbed into the lung and blood through the nose. It can reduce depression, stress and chronic fatigue by activating the limbic system and hormones and increasing emotional reaction through the sense of smell. This non-invasive method can be used regardless of time and place and is a representative aromatherapy as it is convenient, works rapidly and provokes nearly no side effect [8,9]. There are over 200 types of natural fragrance oil utilized for aromatherapy. It is known lavender is effective against anxiety, stress and depression as a strong sedative and recovers muscle fatigue and helps blood circulation. In addition, chamomile relieves anxiety, stress and depression and has an effect on recovery from fatigue and sweet orange with a sweet and fresh mandarin flavor is known to have anti-depression, anti-stress and anti-convulsive effects and to produce relaxation [6,10,11].

Around 90% of studies related to aromatherapy in Korea were performed after 2000 and they were applied to various subjects such as patients before operation [12], subjects before gastroscopy [13] and hemodialysis patients [14], female college students with menstrual stress [15] and with menstrual pain and dysmenorrhea [16], women in labor [17], middle-aged women [18], the elderly [19], high school students [9], hemiplegia patients, stroke patients, essential hypertension patients, hospice patient, night-shift nurses and so on. These studies also evaluated the effect of aromatherapy with various variables like depression, anxiety, stress, pain, sleep disorder, blood pressure, reaction of autonomic nervous system, dementia behaviors, labor pain, perceived childbirth experience, self-esteem and quality of life and so on [9,12,13,14,15,16,17, 18,19].

As researches applying aromatherapy to nursing students, there have been ones investigating the effects of the therapy on activation of autonomic nervous system [20], the effects on presentation anxiety and presentation behaviors [21] and the influence on stress, anxiety and depression with the students facing clinical practices, inducing stress [22], graduation [5] and national examination [3]. A study reported that aroma inhalation using necklaces applied to nursing students before their first clinical practice reduced stress but did not decline anxiety [22].

Therefore, the research to treat the anxiety of nursing students practicing first intravascular injection has been rarely conducted. Lamp inhalation is a simple intervention which can be applied to many persons in a same place without any complex procedure [22] and it is considered to be utilized as an intervention to reduce anxiety of nursing students over intravascular injection practice which is invasive to provoke anxiety among many students and is conducted in a limited place of a practice room.

This study aims to determine whether aromatherapy decreases the anxiety of nursing students about their first intravascular injection practice by applying it to the practice of fundamental nursing.

2. Purpose and hypothesis

The purpose of this study is to investigate whether aroma inhalation is effective in relieving the anxiety of nursing students who face their first intravascular injection practice. The main hypothesis is “the experimental group inhaling aroma will experience less anxiety just before intravascular injection than the control group not doing it” and there are five sub hypotheses.

The five sub-hypotheses were as follows:

- 2.1. The experimental group inhaling aroma will show lower systolic blood pressure just before intravascular injection than the control group.
- 2.2. The experimental group inhaling aroma will show lower diastolic blood pressure just before intravascular injection than the control group.
- 2.3. The experimental group inhaling aroma will show lower pulse rate just before intravascular injection than the control group.
- 2.4. The experimental group inhaling aroma will show lower VAS (Visual Analog Scale) just before intravascular injection than the control group.
- 2.5. The experimental group inhaling aroma will show lower McNair score just before intravascular injection than the control group not doing it.

3. Definition

3.1. Intravascular injection practice

Intravascular injection means an injection through a needle directly inserted into the vein to supplement water, electrolyte and others when water cannot be administered orally, to supply blood after hemorrhage, to inject medications such as an antidote into blood directly or to provoke a medicinal effect rapidly [23]. In this study, intravascular injection was defined as a process from inserting 24G angio catheter through the peripheral vein of a nursing student or a partner for the practice to connecting the needle with the infusion set filled with normal saline.

3.2. Aromatherapy

Aromatherapy is a type of therapy to promote physical, mental and psychological health, to maintain health and to enhance vitality by using pure essential oils extracted from herbs with aroma [6]. In this study, aromatherapy meant that after blending two drops of each of lavender, chamomile and sweet orange in the ratio of 1:1:1 with 70 cc distilled water, the subjects inhaled aroma from three points in an about 200 m² room at 23~24°C for at least one hour.

3.3. Anxiety

Anxiety is a signal to inform a psychological conflict and means an indefinite discomfort occurring when a person faces an unfamiliar and new circumstance or role. Anxiety is a subjective emotion from worry recognized consciously. Regardless of objective risks it becomes severer when a person perceives a circumstance threatening [2]. In this study, to objectify anxiety or a subjective emotion maximally five variables including systolic and diastolic blood pressure, pulse, McNair's tension-anxiety scale and Visual Analog Scale (VAS) were measured.

4. Preparation for research ability

One of the researchers obtained a certificate of aroma therapist in 2005 by passing the qualification test including theories and practices after completing basic courses and in-depth courses of the theories and the practices by Korean Nurses Association.

5. Method

5.1. Research design

This study was an equivalent control group pretest-posttest non-synchronized design. It is to investigate the effect of aroma inhalation on the anxiety of nursing students practicing intravascular injection first.

5.2. Sampling

The target population of this study was college students majoring in nursing and its accessible population were those in the second grade taking fundamental nursing in a four-year nursing college located in Daejeon, South Korea. 57 students were recruited through convenient sampling. To secure the homogeneity of academic performance of the two groups, in the order of the academic ranks of former semester, the students at odd numbers and at even numbers were assigned in the control and the experimental groups.

For the participants not to recognize that they were in the experimental group, the researchers explained the purpose and the contents of this study to them two months before the practice and said that the participation in this study would not be reflected in the grade of the practice. And then, the subjects who agreed to take part in this study voluntarily signed the informed consents. Although this study tried to exclude students with rejection against or an experience of side effects of aromatherapy by considering ethical issues, there was no student with it. Totally 57 students signed the consent form and they were divided into 29 and 28 ones in the experimental and the control groups. By excluding two ones not completing the questionnaire after the end of the treatment, the data of 29 and 26 ones from the experimental and the control groups were analyzed.

The sample size was calculated by using G-Power program [24] to obtain a sample size based on Cohen's sampling formula. Independent t-test analysis as a two-tailed test with the significance level of 0.05 and the power of 0.8, revealed that when the effect size was large ($d=.80$) (effect size convention) the numbers of the experimental and the control groups were calculated to be 26, so the sample size of this study satisfied Cohen's formula.

5.3. Procedure

The experimental treatment and data collection were performed on 25 May 2010. To control the spread of the treatment, the control group conducted the practice first and then the experimental group did it in the same room on the same day.

Pretest was performed to confirm the homogeneity of the degree of anxiety of the two groups. Before the students entered into the practice room, they listened to explanation on the procedure of the practice, the questionnaire and the measurement of vital signs and their systolic and diastolic blood pressure, pulse, McNair's tension-anxiety scale score and VAS score were measured.

For the experimental treatment the aroma was wafted just after the pretest to the end of the posttest. The aroma oils used in this study were lavender, chamomile and sweet orange. After blending two drops of each of them together with 70cc distilled water in the ratio of 1:1:1, their aroma wafted from three points in a 200 m² room at 23~25 °C. Blending is a combination of essential oils made creatively by an aromatherapist by considering therapeutic effects, duration of aroma and personal tastes of subjects, and this study blended lavender (*Lavendular angustifolia*), chamomile roman (*Anthemis nobilis*) and sweet orange (*Citrus sinensis* Osbeck). Lavender used in this study is called as True Lavender and is widely utilized as a pain killer, a sedative and an anti-depression agent with a familiar aroma to the public. Lavender matches well most oil in the combination, but especially it is blended with Citrus and Floral well. Chamomile roman is one of Floral known to be effective in relieving mental tension and in leading to stability, and sweet orange, which has a sweet and fresh fruit scent among Citrus, has effects against diseases related with anxiety, nervous tension and

stress and is effective in reducing depression, anxiety and stress and in relieving tension [6]. According to classification of aroma note based on the duration of aroma, this blending was identified to harmonize well.

The subjects of the experimental group were exposed to the aroma continuously just after entering into the practice room after the pretest to the end of posttest. As they learned the method of intravascular injection and waited their turn to practice the injection, they were treated by the aroma at least one hour.

The researchers provided the subjects with a 20-minute lecture about the purpose, the preparation, the method, the matters requiring attention, the side effects and the care of the injection and one-time demonstration in the practice room and the students prepared materials for the practice individually. And then, posttest was conducted just before practicing intravascular injection. Like the pretest, the five variables including systolic and diastolic blood pressure, pulse, McNair's tension-anxiety scale score and VAS score were measured for the posttest.

5.4. Measurement instruments

In this study, anxiety was measured in systolic and diastolic blood pressure, pulse, McNair's tension-anxiety scale and VAS.

Blood pressure and pulse were gauged from the left brachial artery with an electronic automatic sphygmomanometer (UA-777 Model, A&D Co. Japan) which has an error limit of blood pressure ± 3 mmHg and pulse $\pm 5\%$. During they checked blood pressure and pulse, participants sat in a chair, and their levels were recorded.

McNair anxiety scale consisted of nine questions of tension-anxiety domain of the Profile of Mood States (POMS) developed by McNair, Lorr, & Droppleman [25] and translated by Lee [4]. The questions were five-point scale and recorded totally five to 45 points. Higher score meant that a subject had severer anxiety. Lee reported that for its Cronbach α was .75 and in this study Cronbach α was .85 and .89 in the pretest and the posttest [4].

VAS examined the anxiety by requiring a subject to present a point showing his or her condition between one end showing 'extreme anxiety' and the other meaning 'no anxiety' on a 10cm line without a number or a mark of interval and the length from the end meaning 'no anxiety' was measured in mm.

5.5. Statistical analysis

The collected data were analyzed with PASW. For general characteristics of the subjects, real numbers, percentages, means and standard deviation were measured. To confirm the homogeneity of general characteristics and anxiety of the experimental and the control group in the pretest, χ^2 test and t-test were used. The difference in anxiety after the treatment and in change before and after the treatment between the two groups was analyzed with t-test.

6. Results

6.1. Homogeneity of general characteristics and pretest anxiety between two groups

The totally 55 subjects included 29 ones of the experimental and 25 ones of the control groups. All of them were in the second grade of nursing department, and as both of the two groups had two male students, respectively the distribution by gender was same in the two groups. To verify the academic achievement of the two groups the average grades for the last semester were compared. They were found to be 3.59 ± 0.40 and 3.64 ± 0.34 points in the experimental and the control groups, respectively and there was no significant difference between the two groups (Table 1).

Table 1. Comparison of general characteristics of the experimental and control group (N=55)

Characteristics	Experimental Group(n=29) N(%) Mean±SD	Control Group(n=26) N(%) Mean±SD	χ^2/t	p	
Age	20.2±1.37	20.1±1.19	-1.158	.875	
Sex	male	2(7.14)	2(7.40)	.020	1.000
	female	26(92.8)	25(92.6)		
Academic score	3.59±0.40	3.64±0.34	-.473	.638	

The results of pretest conducted to confirm the homogeneity of the degree of anxiety between the two groups, are presented in Table 2. The average systolic blood pressure was 115.97(±7.69) and 114.46(±8.11) mmHg in the experimental and the control groups, and the average diastolic blood pressure was 77.83(±6.46) and 76.12(±6.79) mmHg in the two groups. No significant difference in blood pressure was observed. The pulse of the experimental and the control groups recorded 76.66(±6.77) and 75.92(±8.44) times/minute and the difference was not significant. The degrees of anxiety measured with McNair's tension-anxiety scale were averagely 17.00(±6.17) and 17.31 (±5.36) points in the two groups and the degrees of anxiety investigated with VAS were 24.69(±19.76) and 29.65(±22.84) in average in the two groups. So any significant difference was not found between two groups in pretest.

Table 2. Comparison of anxiety between the experimental and control group in pretest and posttest (N=55)

Variables	Experimental group(n=29) mean(±SD)	control group(n=26) mean(±SD)	T	p	
Systolic Pressure	pre	115.97(± 7.69)	114.46(± 8.11)	.706	.484
	post	124.48(± 8.36)	128.27(± 6.74)	-1.835	.072
Diastolic Pressure	pre	77.83(± 6.46)	76.12(± 6.79)	.958	.342
	post	81.59(± 7.69)	82.54(± 7.49)	- .484	.630
Pulse	pre	76.66(± 6.77)	75.92(± 8.44)	.356	.723
	post	95.17(± 9.37)	100.65(±10.14)	-2.084	.042
McNair Scale	pre	17.00(± 6.17)	17.31(± 5.36)	-.916	.845
	post	27.00(± 7.11)	27.35(± 7.48)	- .176	.861
VAS	pre	24.69(±19.76)	29.65(±22.84)	-.864	.391
	post	61.45(±16.18)	69.85(±18.39)	-1.801	.077

6.2. Validation of aroma effect

To verify the effect of aromatherapy on the degree of anxiety of nursing students facing their first intravascular injection practice, the degree of anxiety was measured with systolic and diastolic blood pressure, pulse, McNair's tension-anxiety scale and VAS and their results are shown in Table 2.

The systolic blood pressure of the experimental and the control groups was not significantly different by recording 124.48(±8.36) and 128.27(±6.74) mmHg and the diastolic blood pressure of the two groups also did not show any significant difference by recording 81.59(±7.09) and 82.54(±7.49) mmHg. Self-reported McNair anxiety scale recorded 27.00(±7.11) and 27.35(±7.48) points in the experimental and the control groups and VAS scores of the two groups also were not significantly different by recording 61.45(±16.18) and 69.85(±18.39) mm in the experimental and the control groups. The pulse was 95.17(±9.37)

and 100.65(±10.14) times/minute in the experimental and the control groups and the difference was statistically significant ($t=-2.084$, $p=.042$).

To analyze the pattern of changes of the degree of anxiety following aromatherapy, the difference between pretest and posttest results was analyzed and the increase of systolic blood pressure and pulse was significantly less in the experimental group than in the control group. The change of systolic blood pressure was 8.52(±8.23) and 13.81(±10.30) mmHg, in the experimental and the control groups, so that of the experimental group was statistically significantly lower than that of the control group ($t=-2.114$, $p=.039$). The change of the pulse was also significantly lower in the experimental group than in the control group by recording 18.52(±10.03) and 24.73(±11.29) times/minute ($t=-2.161$, $p=.035$) (Table 3).

Table 3. Analysis of the gaps between pre test and post test (N=55)

Difference of (pretest -posttest)	Experimental Group(n=29) mean(±SD)	Control Group(n=26) mean(±SD)	T	p
Systolic Pressure	8.52(± 8.23)	13.81(±10.30)	-2.114	.039
Diastolic Pressure	3.76(± 5.25)	6.42(± 7.41)	-1.550	.127
Pulse	18.52(±10.03)	24.73(±11.29)	-2.161	.035
McNair Scale	10.00(± 7.14)	10.04(± 9.17)	- .017	.986
VAS	36.76(±21.01)	40.19(±24.76)	- .556	.580

7. Discussion

Aromatherapy is one of the most common interventions in complementary and alternative therapy, and more and more studies proving its effects on various health problems have been reported in many academic fields. Most of these studies investigated the effect on psychological variables. According to the study of Song et al. analyzing 130 research articles about aromatherapies for the last 10 years, the most frequent variables were anxiety, stress, depression and pain in the order [7]. Especially the studies dealt with anxiety were about 23% of the total, so that it has been paid attention as an outstanding aromatherapy intervention.

This study found that when anxiety was investigated just before practicing intravascular injection the five variables of anxiety tended to increase in both of two groups with and without aroma treatment compared to the results of pretest. However, only pulse was found to be significantly lower in the experimental group than in the control group and the analysis on the increase from pretest to posttest showed that systolic blood pressure and pulse were raised significantly less in the experimental group than in the control group. In other words, aromatherapy was found to have effects on systolic blood pressure and pulse out of the five variables to measure anxiety, so it was effective in reducing somewhat anxiety. This finding was different from that of a previous study of Seo saying that for stress of high school student both of systolic and diastolic pressure were significantly affected [9], and it was partially consistent with that of a study of Oh, Kim & Park reporting that when they examined the effect of aromatherapy on anxiety of patients undergoing surgical treatment for uterine myoma systolic blood pressure, pulse and VAS score were significantly different but the difference in diastolic blood pressure was not significant [11].

Previous studies on aroma inhalation were reviewed in terms of treatment methods. While this study utilized the lamp for inhalation by blending lavender, chamomile and sweat orange, the study of Seo [9] with high school students as subjects asked them to wear bergamot necklace for nine hours a day for a week and the study of Oh, Kim, & Park [11] with patients

undergoing operation for uterine myoma as subjects required them to breathe deeply after applying lavender and bergamot around the nose and the back of the ear. In other research Kim, Kim & Park found that when dialysis patients inhaled blended lavender and sweat orange by wetting gauze with them for seven days the inhalation was very effective in decreasing their anxiety [10]. Like this, in even studies applying aromatherapy types of essential oils, blending methods and application methods were largely different, and it should be considered that researches about aroma inhalation also utilized a considerable range of inhalation method such as using a lamp or a necklace and applying essential oils around the nose and the back of the ear.

The variables which provoked a significant difference following aromatherapy were systolic blood pressure and pulse in this study, but it needed to discuss whether systolic blood pressure and pulse are the most sensitive to anxiety. For studies about anxiety, the widely used variables were systolic blood pressure, diastolic blood pressure, pulse, VAS and self-reported anxiety scale. In particular, state anxiety scale was utilized in many cases. Oh, Kim, & Park tried to decrease preoperative anxiety of women with uterine myoma through aroma inhalation and found the decrease of anxiety variables including systolic blood pressure, pulse and VAS except diastolic blood pressure after two times of inhalation [11]. Kim & Sung investigating the effect of aroma massage with subjects before conscious sedation colonoscopy reported that after aroma inhalation state anxiety, systolic pressure, pulse and VAS decreased and diastolic blood pressure was not significantly different [26]. Koo, Jo, Kim & Park insisted that when preoperative anxiety was measured by providing young patients and their parents with information and pictures about the operation VAS was different but systolic and diastolic blood pressure and pulse did not show significant difference [27]. Like these previous studies, variables to measure the change of anxiety following aromatherapy were different by studies and their effects were also not consistent. The inconsistent findings about various measured variables of anxiety or an outcome were considered to be because anxiety tended to change according to external environments or time, errors caused by measurement time or an investigator were hard to be controlled and physiological reactions were different according to individuals [22]. Different intervention time and frequency and many personal extraneous variables related to physiological reaction and reaction time to anxiety also could work. Therefore, it was hard to say that the finding that only pulse and systolic blood pressure showed a significant change after the aroma treatment meant that the variables were more sensitive to anxiety in a short term.

Anxiety is a very complex phenomenon. These days it is clinically defined as a socio-psychological condition of worry, fear and concern combining with physical symptoms [28]. Anxiety or stress changes according to external environments and time, errors due to measurement time or an investigator are hard to be controlled and physiological reactions largely differ by individuals [22]. Therefore, anxiety as an outcome is found to be different inconsistently according to various measured variables because there are many types of anxiety and various intervention time and frequency and physiological reaction and reaction time to anxiety also can be different due to personal extraneous variables.

Many studies have applied aromatherapy to nursing students to relieve anxiety and stress related with their anxiety over tests, clinical practice, presentation and job. Adalet, Emel & Dilek recruited 50 and 45 college students of health-related departments including nursing for the experimental and the control groups, respectively and wafted lavender only for the experimental group from 15 minutes before the test to 60 minutes for the test out of the two groups in places with same conditions [29]. According to the results, the anxiety scores were significantly lower in the experimental group than in the control group but the scores in the test did not show any significant different. For studies performed in Korea, Lee, I. S. found

that after aroma inhalation the anxiety of nursing students facing the national examination reduced significantly [3], and the inhalation was also effective in declining the anxiety of nursing students in graduating class [5]. However, the study of Lee & Lee reported that aromatherapy did not decrease anxiety about presentation among nursing students [21] and Lee revealed that it reduced stress before the first clinical practice but it was not effective in declining anxiety [22], so these results were not consistent and elaborately designed repeated studies were necessary.

To realize the development of nursing it is important to pay attention to nursing education to teach nursing students well and to help them to learn nursing effectively from the point of the students. This study was meaningful as it tried an intervention to cope with anxiety of nursing students over intravascular injection, which was the most invasive and provoked anxiety out of nursing practices, and confirmed its effects.

8. Conclusion

This study was conducted to determine whether aroma inhalation was effective in reducing anxiety of nursing students facing their first intravascular injection practice or a basic nursing practice. Its subjects were nursing students in the second grade taking fundamental nursing class in four-year nursing college, and 29 and 26 ones were in the experimental and the control groups, respectively. The experimental treatment and data collection were performed on 25 May 2010 and anxiety was examined with five variables of systolic blood pressure, diastolic blood pressure, pulse, McNair's tension-anxiety scale and VAS. For the experimental treatment, lavender, chamomile and sweet orange were blended in the ratio of 1:1:1 and wafted. The collected data were analyzed with PASW and the sub hypothesis was proved based on the results as follows.

The first sub hypothesis, 'the experimental group using aroma inhalation recorded lower systolic blood pressure just before intravascular injection practice than the control group, was rejected ($t=-1.835$, $p=.072$).

From these results, only pulse out of the anxiety variables measured just before the practice of intravascular injection showed a significant difference between the experimental and the control groups, so the main research hypothesis of this study, 'the experimental group exposed to aroma inhalation had less anxiety before intravascular injection than the control group not exposed to it' was partially supported. In addition, as the increase of systolic blood pressure and pulse from the pretest levels to the posttest levels examined just before the injection was observed to be significantly less in the experimental group than in the control group, aroma inhalation was found to have a partial effect. However, this study has a limitation to support fully the effect of aroma treatment on the decrease of anxiety because it utilized one-time treatment.

9. Suggestions

Based on the results of this study followings are suggested.

- Simply applied aroma inhalation was found to be effective in reducing anxiety of nursing students in the fundamental nursing practice field, so it is suggested that the inhalation can be used as a nursing intervention to promote their learning effectively during fundamental nursing practices.
- Studies about effects of aroma inhalation on performance of nursing skills are suggested.

- Development of an aroma inhalation intervention considering personal preference of aroma is necessary.

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