

A study of the clinical efficacy of frankincense in the acute phase of ischemic stroke

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Received: 28/Feb/2015 Accepted: 7/Mar/2015

ABSTRACT

Background and aims: Ischemic stroke is the most common type of stroke and its most important symptoms are paralysis and movement disorders. Therefore, finding a method for treating this disorder is greatly important. This study was conducted to investigate the clinical efficacy of frankincense on the patients with ischemic stroke.

Methods: In this clinical trial study, 60 patients with ischemic stroke were randomly assigned into two groups of treatment and control (30 patients in each group). In the treatment group, in addition to the routine treatment of stroke, four capsules containing 500 mg of powdered frankincense were used daily, but in the control group, only the treatment of stroke (without frankincense) was implemented. Treatment continued for one month. NIHSS questionnaire (to assess speech and muscle strength) was completed at the baseline, on the seventh day and at the end of treatment for each patient. In this study, statistical analysis was carried out by t- test, chi-square and Mann-Whitney using SPSS software.

Results: The results showed that only in the second step in the treatment group, the rate of recovery of the left lower and muscle strength of upper limbs was significantly increased in patients compared to the control group.

Conclusion: Introducing frankincense into treatment for stroke patients can contribute in improving muscle strength of the patients with muscle weakness in non-dominant hemisphere in acute phase of neurological disorder, while it has no effect improvement of muscle strength of right limbs or speech.

Keywords: Stroke, Frankincense, Movement disorder, Speech disorder.

INTRODUCTION

Stroke is lack of blood supplement to an area of the brain, resulting in a loss of neurological function.¹ This disease is the third leading cause of death worldwide after cardiovascular disease and cancer.^{2,3} Ischemia is the decreased blood supplement to an

organ or a part of the body which reduces the transport of oxygen and nutrients into tissues and as a result causes dysfunction of the organs. Ischemia may be caused by atherosclerosis, blood clotting, vasoconstriction, embolism, low blood pressure and some

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cancers.⁴ One type of ischemia is ischemic stroke,⁵ which includes three sub-groups, thrombosis, embolism and reduced systemic perfusion, the most common problems of the blood supplement to the brain and other organs.⁶

Stroke has many symptoms, the most marked of which are hemiparesis and hemiplegia (weakness and/or paralysis of one half of the body).^{2, 3} In this disease, by neurologic examination, the disorder is recognized and then confirmed by CT scan or MRI.⁷⁻⁹ For the treatment of the disease in acute phase, various drugs such as antiplatelet agents, anticoagulants and blood pressure-lowering drugs are used, and antidepressants are given in the chronic phase.¹⁰ Olibnum (frankincense) is a resin made from a plant belonging to the Burseraceae family and the genus of *Boswellia*,^{11,12} which contains many compounds^{13,14} including boswellic acids as the most abundant.¹⁵ Frankincense important derivatives include -boswellic acid, 3-acetyl- -boswellic acid, 11-keto-boswellic acid and 3-acetyl-11-keto- -boswellic acid.¹⁶

According to the conducted studies, terpenoid acids particularly -boswellic acid and its derivations act as anti-inflammatory agents and specific inhibitors of the enzyme 5-lipoxygenase (the enzyme responsible for inflammation).¹⁷ Another compound found in this resin is incensole acetate which may also have a neuroprotective state, anti-depression and anti-anxiety effects, with anti-inflammatory effects on the brain.^{18,19} Frankincense, in Islamic and Iranian traditional medicine, has been recommended to enhance memory in the elderly and also to promote intelligence in the children, so pregnant women have been advised to consume it.^{20,21} Also, many studies have been done to demonstrate these activities. In a study, the effect of daily consumption of one ml of frankincense aqueous extract

(containing 20 mg oral frankincense) on significant increase in the power of learning in post learning stage, short-term memory and long term memory was reported in neonatal rats in treatment group.²²

In another study, frankincense effect on memory loss was investigated in the mice with hypothyroidism. The researchers found that the use of frankincense could prevent learning disorder and memory loss caused by hypothyroidism.²³ It should be noted that based on the toxicology studies of frankincense resin on animals, significant pathological, hematologic and genotoxic changes were not caused at up to 1000 mg/kg concentrations.²⁴ In addition, the side effects are insignificant and negligible in humans, and only in some cases nausea, reflux and digestive disorders have been reported, but on the interaction with other drugs, no report has been yet published.²⁵ The growing prevalence of stroke and central nervous system vascular disorders in today communities, and its debilitating clinical symptoms and severe and irreversible complications such as paralysis greatly affected the patient's daily and routine activities. On the other hand, stupendous economic costs are needed for treating these complications by physiotherapy and occupational therapy. In this study, for the first time, the therapeutic effects of frankincense were examined accompanied with anticoagulant and anti-platelet drugs on recovery of muscle strength and speech ability in patients with ischemic stroke.

METHODS

This is a single-blinded clinical trial study conducted on 60 patients referred to Emergency of Ayatollah Kashani Hospital of Shahrekord with stroke symptoms and CT scan diagnosis of ischemic stroke in this hospital within six months. Sampling was

done per non-probability, convenience method. Therefore, the patients with all inclusion criteria (sudden onset of symptoms and diagnosis of ischemic stroke) were enrolled into the study after consent was obtained, and then they were assigned randomly into two groups, treatment (receiving capsules containing powdered frankincense) and control (without frankincense administration).

The two groups were matched for age, gender, clinical symptoms and place of ischemia in CT scan. Then, in the treatment group routine treatment of stroke alongside frankincense capsule (one 500 mg frankincense capsules taken every 6 hours), and in the control group, routine treatment of stroke without frankincense capsule were implemented. The patients with gradual onset of symptoms and non-ischemic stroke were excluded from the study.

It should be noted that frankincense is used routinely for many years and is part of the therapeutic regimen for stroke patients, and hence causes no pharmacologic intervention in these patients. It is also used in traditional medicine in most countries and it has been accepted by people. In this study, after giving sufficient explanation to patients, written consent was obtained from them and the study protocol was approved by the Ethics Committee of Shahrekord University of Medical Sciences.

All patients underwent treatment for one month and then NIHSS questionnaire (a quantitative instrument to measure neurological disorder of stroke),²⁶ only the sections concerning movement and speech, was administered, so that two questions were related to limbs' muscle strength with maximum score 4 (the lowest strength) and minimum score 0 (the highest strength) for each question, and two questions were related to speech with maximum score 3 (the lowest ability) and minimum score 0 (the highest ability) for each question. At the end, the scores were aggregated and analyzed.

The assigned practitioner and physician had the questionnaires filled out in three steps, before treatment, the first week after treatment (in hospital) and at the end of a month. The third step of filling out the questionnaires was run after arrangement with the patients, so that the patients who were able to refer the clinic were followed up while they were present in person and those who were not were followed up by telephone.

Then, the data were analyzed by SPSS software 17 using independent t- test, chi-square and Mann-Whitney in SPSS software.

RESULTS

In the treatment group, of 30 patients with a mean age of 71.5 ± 12.1 years, 14 (46.7%) patients were men and 16 (53.3%) were women, and of 30 patients in the control group with a mean age of 73.9 ± 8.4 years, 12 (40%) patients were men and 18 (60%) were women. Using t-test showed no significant difference in age and gender between two groups ($P=0.37$ and 0.60 , respectively).

The range and median of muscle weakness in patients of the two groups are summarized in Table 1. By Mann-Whitney test, in the first step (before treatment), for the type of neurological disorder, 17 (28.3%) had muscle weakness in the right limbs, 21 (35%) had muscle weakness in the left limbs and 22 (36.7%) had speech disorder. No significant difference was seen in neurological disorder between two groups ($P>0.05$). In the second step (first week after treatment), the rate of recovery of left limbs was significantly higher in the treatment group than the control group ($P=0.036$). No significant difference was seen in recovery rate of right limbs between two groups ($P=0.481$). No significant difference was seen in speech disorder treatment between

two groups (P=0.847), as well. In the third step (after one month of treatment), no significant difference was seen in the rate of limbs and speech recovery between two

groups (P>0.05). Frequency distribution of CT scan results is shown in Table 2. By chi-square, frequency distribution of CT scan was similar in two groups (P=0.544).

Table 1: Range and median of neurological disorder in two groups, treatment and control

Type of involvement	Step	Control			Treatment			P-value
		Minimum	Maximum	Median	Minimum	Maximum	Median	
Right hand	First	1	4	2	1	4	3	0.88
	Second	0	3	1	0	3	0.5	0.42
	Third	0	3	1	0	3	0.5	0.81
Left hand	First	1	4	3	1	4	2	0.13
	Second	0	3	2	0	3	1	0.72
	Third	0	3	1	0	3	1	0.11
Right leg	First	1	4	2	1	4	3	0.88
	Second	0	3	1	0	3	0.5	0.48
	Third	0	2	1	0	3	0.5	0.96
Left leg	First	1	4	3	1	4	2	0.13
	Second	0	3	1.5	0	2	1	0.29
	Third	0	3	1	0	3	1	0.173
Right leg	First	2	6	2	2	6	2	0.84
	Second	0	6	2	0	2	2	0.84
	Third	0	6	1	0	2	2	1
Left hand and leg	First	2	8	6	2	8	4	0.13
	Second	0	6	3.5	0	4	2	0.03
	Third	0	6	2	0	6	2	0.11
Right hand and leg	First	2	8	4	2	8	6	0.88
	Second	0	6	2	0	6	1	0.48
	Third	0	5	2	0	6	1	0.88

Table 2: Frequency distribution of CT scan result in patients of treatment and control groups

Groups	CT scan		Left ischemia		Right ischemia		Normal	
	No.	%	No.	%	No.	%	No.	%
Control	7	23.3	12	40	11	36.7		
Treatment	9	30	8	26.7	13	43.3		

By chi-square test, there was no significant difference in frequency distribution of CT scan between the two groups (P>0.05).

DISCUSSION

The results of the present study indicated that use of frankincense capsules accompanied with treatment alone could significantly increase the rate of recovery of

disorder in the left limbs in the second step (acute phase).

In several studies, the effect of frankincense on nervous system has been investigated.

Moussaieff et al. studied the neuroprotective effects of incensole acetate (one of frankincense derivatives) on rats with head trauma and investigated cognitive function and neurological behavior of rats, and reported that this resin had anti-inflammatory activity and most probably neuroprotective effects.¹⁸ Hosseini Sharifabad et al. reported that, after daily use of frankincense extract (100 mg/kg) in lactating rats, the cell body volume of neurons in the hippocampus (an index to improve the performance of the hippocampus) of infants increased.²⁷ These researchers also examined the effect of aqueous extract of frankincense during lactation on the morphology of neurons in the hippocampus of rats' infants, and reported an increase in hippocampal dendritic branches.²⁸

Also, some researchers investigated anti-inflammatory and blood cholesterol-lowering effects of frankincense. In a study of acetyl-11-keto- β -boswellic acid effect (one of frankincense derivatives and natural inhibitor of proinflammatory transcription factor nuclear factor κ B (NF κ B) on atherosclerotic plaques in mice with deficiency of ApoE, it was reported that the frankincense, through inhibition of NF κ B activity, can be used as a traditional medicine for the treatment of chronic inflammatory diseases such as atherosclerosis.²⁹ Dashti et al. investigated the effect of frankincense extract (500 mg/kg) on the atherosclerosis in the coronary arteries of rabbits fed with a high cholesterol diet after five weeks, and reported that frankincense, through influencing lipid metabolism, can reduce serum cholesterol levels, triglycerides and lipoprotein, and reduce atherosclerosis in all vessels.³⁰ Most of these studies confirm the present study findings. However, most studies have studied mice and only one study has examined the effect of

frankincense on the human nervous system. Kirste et al. in study of frankincense effect on brain edema in patients undergoing radiotherapy for brain tumors reported that brain edema was significantly reduced in the group receiving frankincense.³¹ It seems that since one of the pathophysiologicals of stroke is the brain edema due to ischemia, frankincense can also be effective on the patients' symptoms, which was partially confirmed by the present study. However, frankincense was demonstrated to contribute in treatment of movement disorder in acute phase in the patients' left limbs in the present study, which could be explained by possibly greater frankincense effect in the patients with impaired non-dominant hemisphere, and the use of some drugs such as neuroaid capsule at the third step by both groups of treatment and control could explain recovery of the symptoms in the two groups at this step.

CONCLUSION

In view of the results of the present study, introducing frankincense into treatment for stroke patients can contribute to improving muscle strength of the patients with muscle weakness in non-dominant hemisphere in acute phase of neurological disorder, while it has no effect on improvement of muscle strength of right limbs or speech. Of course, it is better to investigate frankincense effect on other symptoms in the patients with stroke and chronic ischemic stroke, and also more research should be conducted to further elucidate frankincense effect on the mechanism of cerebral ischemia.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

ACKNOWLEDGEMENT

Hereby, Research and Technology Deputy of Shahrekord University of Medical Sciences and Clinical Research Development Ward at Ayatollah Kashani Hospital of Shahrekord are sincerely appreciated for their full cooperation in conducting this research.

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How to cite the article: Jivad N, Rafieian-Kopaei M, Rezaei-Kheirabadi F, Khosravi Sh, Azizi M. Study of the clinical efficacy of frankincense in the acute phase of ischemic stroke. *Adv Herb Med*. 2015; 1(2): 4-10.