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Review Article

A CRITICAL ANALYSIS OF *RASONADI KASHAYA* IN ISCHEMIC STROKE

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ABSTRACT

Stroke is undoubtedly a medical emergency, which even if properly managed can leave a person either physically or mentally crippled. Ischemic stroke is the most common form, where etiology of atherosclerosis had proven its link. The clinical features of stroke stands close to the disease *Pakshaghata* in *Ayurve*da and all Acaryas had given a detailed description regarding the *Nidana* (cause)–*Samprapti* (pathogenesis)–*Bheda* (types) *& Chikitsa* (treatment). Ischemic stroke may be related to *Vata-kaphaja* type of *Pakshaghata* as there is involvement of *Srotorodha* (obstruction). Hence the treatment aims include *Vata-kapha samana* (pacifying) measures, removing *Srotorodha* (obstruction), selecting drug having *Katu rasa* (pungent), *Usna virya* (hot potency) etc. Without provocation *Pitta, Rasonadi kashaya* explained for *Vatavikaras* (musculoskeletal, nervous disorders etc) contains *Rasona* (*Allium sativum* Linn), *Pippali* (Piper *longum* Linn.), *Karavi* (*Carum carvi* Linn.) and *Sthira* (*Desmodium gangeticum*) that satisfies the above properties. The drugs also possess *Rasayana* (nourishing /immunity /prevents recurrence) which is a good choice here as there is *Dhatukshaya* (catabolism of basic elements). Ayurvedic as well as modern analysis of the pharmacological properties of the drugs stands together with properties like anti –inflammatory, anti lipidemic, antiglycemic, antioxidant, anti microbial actions, thus proving beneficiary in both therapeutic and preventive aspects of ischemic stroke.

KEYWORDS: *Rasonadi kashaya*, Ischemic stroke, Atherosclerosis, *Pakshaghata, Vatavikaras,* Ayurveda.

INTRODUCTION

Stroke is a clinical condition where rapid focal disturbance occurs, affecting cerebral function which if lasts more than 24 hours may lead to death, with no apparent cause other than vascular origin. Survival of brain cells for few seconds without blood supply can create irreversible damages in brain, which makes stroke fall into a crucial category that requires urgent sufficient management. Stroke as in majority of cases is a clinical manifestation of an unmanaged lifestyle disorder where the main culprits include DM,HTN, Hyperlipidemia etc. Hypercholesterolemia is a major risk factor for the development and progression of atherosclerosis and related cardiovascular diseases(CVD)which can lead to either haemorrhage or embolism or thrombosis resulting in cerebro vascular accidents. The most common form is Ischemic stroke followed by haemorrhagic stroke. Ischemic stroke occurs either due to thrombosis or due to emboli formation.

Older age, family history of thrombotic stroke, diabetes mellitus, hypertension, tobacco smoking, abnormal blood cholesterol [particularly, low high-density lipoprotein (HDL) and/or high low-density lipoprotein (LDL)], and other factors are either proven or probable risk factors for ischemic stroke, largely by their link to atherosclerosis. Risk of stroke is much greater in those with prior stroke or TIA. Many cardiac conditions predispose to stroke, including atrial fibrillation and recent MI.

Ischemic stroke [1]

Cerebral ischemia occurs when blood flow to brain reduces and lasts longer than several seconds. A fall in cerebral blood flow to zero can lead to ischemia, infarction and eventually death of brain cells. If blood flow is restored prior to a significant amount of cell death, the patient may experience only transient symptoms, i.e., a TIA. Ischemia leads to necrosis by neuron starvation of glucose, which in turn results in failure of ATP production. As a result, membrane ion pumps stop functioning and neurons depolarize, and intracellular calcium rises. Cellular depolarization also causes excess glutamate release thereby producing neurotoxicity by activating receptors that increase neuronal calcium influx. Due to membrane lipid degradation and mitochondrial dysfunction, free radicals are produced which causes catalytic destruction of membranes and damages other vital functions of cells. Fever and hyperglycemia worsens ischemia, so it is reasonable to suppress fever and prevent hyperglycemia as much as possible. Attention is also directed towards preventing the common complications of bedridden patients infections (pneumonia, urinary tract, and skin) and deep venous thrombosis (DVT) with pulmonary embolism.

Ayurvedic concept of stroke

Ayurvedic view of stroke is more or less related to the disease *Pakshaghata* where the management significantly relieves their sufferings. It is explained as one among the *Nanatmaja vyadhi* (caused by *Vata dosa* alone) by Acarya Caraka in Sutra sthana.[2] *Madavakara* in *Madava Nidana* has explained two types *Vatapaitika* and *Vatakaphaja Pakshaghata.*[3] *Vata* affects half of body and dries up *Sira* (blood vessels) & *Snayu* (tendons) leading to *Vimoksha* (loosening) of *Sandhibandha* (joints). As a result,

that part becomes inactive with loss of sensation. If there is association of *Pitta* with *Vata*, there will be burning sensation, warmth and syncope whereas association with *Kapha* produces cold touch, swelling and heaviness in body.

***Samprapti ghatakas*:** (probable pathogenic factors happening in Ischemic stroke according to Ayurveda)

Dosa- *Vata (Prana, Udana, Vyana)*

Dusya- *Rasa, Rakta, Mamsa, Meda, Majja, Sira, Snayu, Dhamani, Mala*

Srotodusti- *Sanga* (Obstruction in cerebral vessels leads to ischemia-paralysis)

Ama- *Ama* formation- *Srotorodha-dosa Prakopa-dhatukshaya* (Thrombus/emboli-obstructs cerebral arteries - ischemia in brain tissue-necrosis).

All these causes *Vataprakopa* (aggravation of *Vata*), i.e., increase in *Ruksha (*dryness*), Sita* (cold) & decrease in *Cala guna* (movement). The atherosclerotic changes in the blood can be considered to be caused by aggravated *Vata* and *Kapha* which causes the cholesterol to accumulate in the blood vessel thereby obstructing the flow leading to infarction. Thus in infarction or ischemic stroke, *Vatakaphahara chikitsa* is done using *Katu, Ruksha, Usna virya oushadhas*.

A critical analysis is made on the action of *Rasonadi kashaya* satisfying above properties in *Vata Kaphaja pakshaghata* with respect to Ischemic stroke.

Critical analysis of *Rasonadi kashaya* in *Pakshaghata*

Rasonadi kashaya, explained in *Sahasrayoga* under *Vatavikaras* contain *Rasona*, *Kaaravi*, *Pippali* and *Sthira* as its contents. [4]

Table 1: Ingredients of *Rasonadi kashaya*

Drug	Botanical Name	Family Name
Rasona [5]	Allium *sativum* Linn.	Liliaceae
Kaaravi [6]	*Carum carvi* Linn.	Umbelliferae
Pippali [7]	*Piper longum* Linn.	Piparaceae
Sthira [8]	*Desmodium gangeticum*	Leguminosae

Table 2: Pharmacological properties of the drugs in *Rasonadi kashaya*

Drug	*Rasa*	*Guna*	*Virya*	*Vipaka*	*Karma*
Lasuna [9]	*Madhura, Lavana*	*Snigda, Guru, Tikshna, Sara*	*Usna*	*Katu*	*Vata-kapha hara, Balya, Brmhana, Rasayana, Vrsya, Netrya*
Karavi [10]	*Katu*	*Ruksha*	*Usna*	*Katu*	*Kaphahara, Medhya, Chakshusya, Grahi*
Pippali [11]	*Katu*	*Laghu, snigda*	*Usna*	*Madhura*	*Vata-kaphahara, Dipana, Vrsya, Rasayana*
Sthira [12]	*Madhura, Tikta*	*Guru, Snigda*	*Usna*	*Madhura*	*Tridosahara, Balya, Vrsya, Rasayana*

Action of *Rasona*

Rasona has been extensively used since generations and properties like anti atherosclerosis, anti microbal hypolipidemic, anti thrombosis, anti hypertension, anti hypoglycaemic has been evaluated scientifically.

Hypercholesterolemic activity.

Based on several interventional studies and animal studies, it has been found that the essential oil fraction of garlic comprises of 60% of diallyl disulphide (DADS) which showed hypocholesterolemic activity, especially in lowering total cholesterol and LDL cholesterol in humans. The cardiovascular protective effects of garlic have also been explored in recent years. [14,15]

Action of *Karavi* [16]

C. carvi seeds had undergone many pharmacological and clinical studies that revealed its potential as antimicrobial, antifungal, antibacterial, antihyperglycemic antihyperlipidaemic, antiulcerogenic, antiproliferative, antidyspeptic, antitumor, molluscidal insecticidal, nematicidal, antioxidant, and anti cancer agent.

Hypoglycaemic activity

The fruit extracts of these plants has a potential to exert a hypoglycemic effect by inhibiting hepatic glucose production and/or by stimulating glucose utilization by peripheral tissues, especially muscle and adipose tissue. The plant extracts could also act as inhibitors of tubular renal glucose reabsorption.

Hypolipidemic activity

Flavonoids and carvone in C.carvi have been found to have strong anti-oxidant activity which showed potent lipid lowering activities especially tryglycerides.

Anti-inflammatory activity

Carvone, the most important component of *C. carvi,* known as an anti inflammatory agent act as a Ca channel blocker and also inhibits 5-lipoxigenase and cyclooxygenase activity thus decreasing the biosynthesis of leucotriens and prostaglandins.

Antioxidant,anti bacterial, antifungal, antistress, nootropic, anticolitic, antifertility activities have also been studied.

Action of *Pippali* [17]

Piperine, a compound isolated from *P. longum* act as CNS depressant, antipyretic, analgesic, anti-inflammatory, antioxidant and possess hepatoprotective activities.

Anti-diabetic activity

Pharmacological and clinical studies have elucidated the anti-hyperglycemic and anti-hyperlipidemic effects of *Piper longum* root aqueous extract (PlrAqe) in streptozotocin (STZ) induced diabetic rats. It has been

suggested as a source for isolating new oral anti-hypoglycemic agents.

Cardio protective

It is proposed that the methanolic extract of *P. longum* (MePl) which contained compounds like alkaloids and amides, lignans, esters and volatile oil prevents the histopathological and biochemical changes in rat model induced of myocardial infarction, thus providing a cardio protective effect. [18]

Anti-inflammatory and Anti-arthritic activity

Piper extracts and piperine possess inhibitory activities on prostaglandin and leukotrienes thus exhibiting anti-inflammatory activity. Piperine posses immunomodulatory activity which in turn showed anti-arthritic effect in arthritis induced rats.[19]

Anti-apoptosis and antioxidant

The anti-apoptosis and antioxidant activity of *P. longum* through TUNEL ASSAY and Radical scavenger activity (DPPH ASSAY) has also been evaluated. [20]

Hypolipidemic activity

Methyl piperine significantly inhibited elevation of total serum cholesterol.

Bioenhancer

Piperine was found to have property to modulate membrane dynamics of structurally and therapeutically diverse drugs so as to enhance its bioavailability [21,22,23]

ACTION OF *STHIRA*

Gangetin in *Sthir*a have been found to have anti – inflammatory action in the exudative and proliferative phases of inflammation.[24] The aerial parts exhibited antidiabetic action by increasing insulin secretion from the existing beta cells.[25] Presence of chlorogenic acid (0.12%) in it has an established lipid lowering potential.[26] *Sthira* contains polyphenols such as caffeic acid and chlorogenic acid, which are reported antioxidantsin the flavonoid fraction.[27] Flavonoid fraction exhibited anti-inflammatory activity and analgesic property.

Cardio protective effect

The roots have hypocholesterolemic and antioxidant functions and prevent myofibrils degeneration and myocyte necrosis during MI. It is antioxidant against revascularization injury[28]and improves the cardiac function, by improving the level of these cardiac enzymes like CK, LDH, SGOT etc.

Gastro protective [29]

The ability to increase regeneration of damaged gastric mucosa makes it gastro protective. Whole plant has antibacterial action. [30]

DISCUSSION

After analysing Ischemic stroke in Ayurvedic view, the main aims in *Chikitsa* (treatment) include removing *Srotosanga* (obstruction from vessels), correcting *Vishamagni* (imbalance in digestive fire) and *Amapachana* (rectifying *Ama*).The drugs should posses *Kaphavata samana* property, *Katu rasa pradhana* (pungent) and *Usna virya* (hot potency). But care must be taken to avoid provocation of *Pitta* as *Pittaparokopa* (aggravation of *Pitta*) can vitiate *Raktadhatu* (blood) which in turn vitiates *Siras* (vessels) and *Kandaras* (ligaments) which are the *Upadhatu* of *Rakta*. Hence *Rasonadi kashaya* becomes a good choice as it is a balanced formulation with *Kapha vata samana* property, *Madhura-katu rasa* & *Usna virya*. At the same time, it is *Balya* (strengthening), *Brmhana* (nourishing) and *Rasayana* (rejuvenating) which eradicates *Dhatukshaya* and *Vatakopa* caused by *Srotorodha*. Except *Karavi*, all other drugs posses *Snigda Guna* (unctuousness) to avoid excess *Rukshata* (dryness) to *Dhatus* (tissues).

A large number of studies have been conducted on the contents of the *Kashaya* (formulation), i.e., *Lasuna, Pippali, Karavi* and *Sthira* to explore the full potential of its pharmacological actions.

From the pharmacological activities reported so far, it is quite clear that *Allium sativum*, *Desmodium gangeticum, Piper longum & Carum carvi* possesses good antioxidant properties, which facilitates its action as an anti-inflammatory, anti-hyperlipidemic, cardioprotective, antiamnesic, antidiabetic, gastroprotective, hepato-protective, neuroprotective and antimicrobial properties. Thus we can conclude that, *Rasonadi kashaya* possessing hypoglycemic action, hypolipidemic action, cardio-protective action, anti-oxidant action, anti-inflammatory action prevents complications/risk factors in ischemic stroke due to Diabetes mellitus, Hyperlipidemia, atherosclerosis, free radical formation, thrombi or emboli formation respectively.

CONCLUSION

The risk factors in Ischemic stroke includes Diabetes mellitus, Hypertension, hyperlipidemia, formation of free radicals, emboli, thrombus etc as they are all linked to atherosclerotic activity. Hence a drug having Hypoglycemic action, Hypolipidemic action, Cardio protective, Antioxidant, anti inflammatory action is essential in both preventive and curative aspects, where *Rasonadi kashaya* finds its place as its ingredients has been proven for their efficacies in many studies.

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