A Review: Use of Rauwolfia Serpentina for Antihypertensive Activity

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Abstract: The root of sarpgandha is a species of flowering plant in the family Apocynaceae has been traditionally used in Ayurveda for many years to treat the variety of diseases of that at been traditionally upper to bear little similar to one another. Rauwolfia Serpentina is a safe and effective treatment of hypertension. This author reviews the scientific literature with regard to the use of Rauwolfia and the treatment of hypertension. Much smaller dose of reserpine is required to obtain the antihypertensive activity. The present review focuses mainly on chemical composition, pharmacology, mechanism of action, side effect and toxicity and antihypertensive effect of Rauwolfia alkaloids. The plant provide clinician with a safe and effective adjunct to high blood pressure.

Keywords: reserpine, hypertension, serpgandha, rauwolfia serpentina

1. Introduction

Rauwolfia serpentina is the dried root of rauwolfia serpentine (linne) bentham ex kurz. (family: Apocynaceae). It is an erect shrub that grows 1 meter in the height and has cylindric stems. These stem have pale bark and consist of light colored viscous latex. [1,2]

![Rauwolfia Serpentina](image)

Rauwolfia Serpentine L. Benth. Ex Kurz. Is an evergreen, woody, glabrous and perennial shrub with maximum height upto 60 cm. The plant posses tuberous root with pale brown cork and elliptic to lanceolate. [3] The plant belongs to the family Apocynaceae and occurs in habitats of tropical and subtropical regions. The family includes 50 species, distributed worldwide in the region of the Himalayas, Indian peninsula, Burma, Indonesia and Shri Lanka and is indigenous to India, Bangladesh and other regions of Asia.[4] The plant is commonly known as Sarpgandha, Chandrabagha, Snake root plant, ChotaChand, Chandrika and harkaya etc. [5] The roots, leaves, and juice are of medicinal importance and have attracted the attention of practitioners of indigenous system of medicine, as it contain a large number of secondary metabolites (N containing indole alkaloids) localized mainly in the roots and rhizomes. It has been used in India as a part of the ayurvedic medical system for the treatment of various alignments.

Scientist have been working on the phytochemical analysis of the plant due to its medicinal importance. It has been used as anthelmentic and antihypertensive drugs. It is used as an antidote against snake bite and bite of other poisonous insects. In diarrhea, dysentery, cholera, fever, opacity of cornea and central epilepsy and ebolic R. serpentine is known to cure various circulatory disorders due to the presence of alkaloids. [6] The room juices or extract is used to treat liver and abdominal pain, various gastrointestinal disorders and to expel intestinal worms from the childrens. [7] Mao et al. (2009) have reported the pancel as a function of the ethnobotanical wealth of north east India. The plant also shows the use by local people of Eastern Ghats, Utter Pradesh, Karnataka and Bangladesh against snake bite. The roots and leaf buds are crushed with milk, made into a paste and used externally on the affected areas. The other diseases such as pneumonia, malaria, body aches, eczema, burns, menstrual disorders, scabies, skin cancer, asthma, respiratory problems, eye inflammation, spleen diseases and fever can also be cured using R. Serpentina.

2. Chemical Composition

Rauwolfia contains many different phytochemicals, including alcohols, suger and glycosides, fatty acids, flavonoids, phytosterols, oleoresins, steroids, tannins and alkaloids. The most important alkaloid found in the plant are indole alkaloids, with more than 50 of those alkaloids having been is lated in the plant.[8]

Indole alkaloids are a group of nitrogenous compounds that are derived from the amino acid tryptophan. They share a common 5 and 6 carbon heterocyclic ring structure with 1 nitrogen molecule.[9]

All part of the plant, including the stem and leaves, contain indole alkaloids, but they are found in highest concentration in the bark of the root. [11] The the identified indole alkaloid include ajmalidine, ajmaline, ajmalinine, aricine, canescine, coryanthine, deserpidine, isoajmaline, isoserine, isoserpiline, lankanesine, rucauffricine, rauhimbine, rauwolfinine, recanscine, rescanmine, reserpiline, reserpin, reserin, thebaine, yohimbine, and yohimbinine. [11, 12]

The exact concentration of alkaloids varies. One study concentration of alkaloids varies. One study found that the yield of total alkaloid ranged from 0.8% to 1.3% of the dry weight of the plant. [10] Another study put the total yield of alkaloids between 0.7% to 0.3% of the root content. [4] The maximum alkaloid content detected in regenerated root was...
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Ultimately, use of reserpine provide that no or few secretory vesicles from uptaking neurons. [19,20] Reserpine prevents intracellular membranes of protein and blood cells. Hepatic metabolism account for to be between 45 and 168 hours in plasma. Its relative half life has been determined to be 4 to 5 hours. Its elimination half life has been found to be between 45 and 168 hours in plasma. Its relatively long elimination half life is believed to be due to its binding to protein and blood cells. Its initial half life in the body to the brain, liver, spleen, kidney and adipose tissue. [15] Other studies have shown that reserpine is also widely distributed red blood cell and peripheral neurons. It has been found to be present breast milk and cross the placenta and blood brain barrier. Its initial half life in the blood has been observed to be 4 to 5 hours. Its elimination half life has been determined to be between 45 and 168 hours in plasma. Its relatively long elimination half life is believed to be due to its binding to protein and blood cells. Hepatic metabolism account for approximately 62% of the degradation of reserpine, where as kidney elimination accounts for less that 8%. Most of the elimination of it occurs through fecal excretion. Between 30% and 60% of eliminated metabolites have been found in reserpine itself.

Mechanism of action
The mechanism of action of reserpine is well researched and well documented. Reserpine bind to protein receptors called vesicular monoamine transporters (VMATs) in the organelle membranes of specialized secretory vesicles of presynaptic neurons. [19,20] Reserpine prevents intracellular neurotransmitters from binding to VMAT proteins and stops secretory vesicles from uptaking neurotransmitters. [21] Ultimately, use of reserpine provide that no or few neurotransmitter are released from the presynaptic neuron. As a result, no or only. Slight promulgation of the nerve impulse occurs in the postsynaptic neuron.

Two isoforms of vesicular transport protein are called VMAT1 and VMAT2. VMAT1 is mainly found in the neuroendocrine cells of the peripheral nervous system, particularly in the chromaffin granules in the adrenal medulla, sympathetic neurons, and platelets. VMAT2 is mainly found in the brain, sympathetic nervous system, mast cells and cells containing histamine in the gut and pancreas. Reserpine has an affinity for VMAT1.[22,23] It has strong affinity and bind almost irreversibly to specific receptors on VMAT, particularly VMAT2.[21]

Rauwolfia and Hypertension
In 1949, Vakil reported on a study of 50 patients with essential hypertension who were treat with Rauwolfia.[26] In that study, 85% of patients experienced a drop in systolic blood pressure, and 81% patient experienced a drop in diastolic blood pressure. In 1952, Vida in Germany and Australia reported a blood pressure drop in 25 patient with hypertension .[26] Arnold and Bach showed a good response in 37 and 50 patients
to-specific receptors on VMAT, particularly VMAT2.[21]

Valentine et al [11] found that the species of the same genus contained variable quantities indole and indole alkaloids and could be used as suitable alternatives to R. Serpentina.

Pharmacology
Reserpine is the most widely studied alkaloid found in R. Serpentina. The first modern paper on reserpine was published in 1931 in the Indian medical Journal by sen and bose.[14] It was first isolated and used by Robert Wallace wigging in 1950.

Reserpine has been classified as an indole alkaloid. It is white to yellow powder that becomes darker when exposed to light. It is odorless, insoluble in water, slightly soluble in alcohol, and freely soluble in acitic acid. It has chemical formulaC21H29N2O, a molecular mass of 609 g, and bitter taste.

In 1952, CIBA Labs (now Novartis) in Switzerland published the first complete report on the chemistry and pharmacology of reserpine. [14] Also in 1952, isolated reserpine was introduced as the drug serpasil for the treatment of hypertension, tachycardia, and thyrotoxicosis.

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several months of use, mental depression can occur and may persist. With extremely large doses, Parkinson-like symptoms, extrapyramidal reactions, and convulsion can occur. Allergic reactions to Rauwolfia, including asthma, are rare.

Adequate doses of reserpine that produce decreased blood pressure will not cause reserpine to include gastric ulcerations. [37] Reserpin has been observed to cause a slight edema in some patients. [38] Possible interaction with other drugs include cardiac glycosides, ephedra, alcohol, antipsychotic drug, barbiturates, diauretics, ephedrine, levodopa, monamine oxidase inhibitors, propanolol, stimulant drug, and tricyclic antidepressants. Rauwolfia may interact with the following lab tests, including tests for corticosteroids, bilirubin, catecholamines, gastric acidity, norepinephrine, prolactine, thyroxine, and vanillymandelic acid.[37]

3. Conclusion

Based on the review of the literature, rauwolfia appears to be the safe and effective treatment of hypertension used in appropriate low doses. These reviews prove to be true in case of sarpgandha as reserpine has reported also human discontinuation of reserpine in hypertension management whereas sarpgandha root is still in wide use. An equivalent dose of pure rauwolfia alkaloids, also known as alseroxylon extract or pure reserpine, can also be used to treat hypertension. The author has found the LDR can be safely recomended to patient who have been screened to be of benefit from the treatment.

References


