Monograph

Terminalia arjuna

Description and Constituents

Terminalia arjuna is a deciduous tree found throughout India growing to a height of 60-90 feet. The thick, white-to-pinkish-gray bark has been used in India's native Ayurvedic medicine for over three centuries, primarily as a cardiac tonic. Clinical evaluation of this botanical medicine indicates it can be of benefit in the treatment of coronary artery disease, heart failure, and possibly hypercholesterolemia. It has also been found to be antibacterial and antimutagenic.

Terminalia's active constituents include tannins, triterpenoid saponins (arjunic acid, arjunolic acid, arjungenin, arjunglycosides), flavonoids (arjunone, arjunolone, luteolin), gallic acid, ellagic acid, oligomeric proanthocyanidins (OPCs), phytosterols, calcium, magnesium, zinc, and copper.[1,2]

Mechanisms of Action

Improvement of cardiac muscle function and subsequent improved pumping activity of the heart seems to be the primary benefit of Terminalia. It is thought the saponin glycosides might be responsible for inotropic effects of Terminalia, while the flavonoids and OPCs provide free radical antioxidant activity and vascular strengthening. A dose-dependent decrease in heart rate and blood pressure was noted in dogs given Terminalia intravenously.[3]

Clinical Applications

Angina Pectoris

An open study of Terminalia use in stable and unstable angina demonstrated a 50-percent reduction of angina in the stable angina group after three months ($p < 0.01$). A significant reduction was also found in systolic blood pressure in these patients ($p < 0.05$). During treadmill testing, both the onset of angina and the appearance of ST-T changes on ECG were significantly delayed in the stable angina group ($p < 0.001$), indicating an improvement in exercise tolerance. The unstable angina group did not experience significant reductions in angina or systolic blood pressure. Both groups showed improvements in left ventricular ejection fraction. Evaluation of overall clinical condition, treadmill results, and ejection fraction showed improvement in 66 percent of stable angina patients and 20 percent of unstable angina patients after three months.[4]

Congestive Heart Failure

A double-blind, placebo-controlled, two-phase trial of Terminalia extract treatment in twelve patients with severe refractory heart failure (NYHA Class IV) was conducted. Either 500 mg Terminalia bark extract or placebo was given every 8 hours for two weeks, in addition to the patients' current

pharmaceutical medications (digoxin, diuretics, angiotensin-converting-enzyme inhibitors, vasodilators, and potassium supplementation). All patients experienced dyspnea at rest or after minimal activity at the start of the trial. Dyspnea, fatigue, edema, and walking tolerance all improved while patients were on Terminalia therapy. Treatment with Terminalia was also associated with significant improvements in stroke volume and left ventricular ejection fraction, as well as decreases in end-diastolic and end-systolic left ventricular volumes compared to placebo. In the second phase of the study, patients from phase I continued on Terminalia extract for approximately two years. Improvements were noted in the ensuing two to three months, and were maintained through the balance of the study. After four months' treatment, nine patients had improved to NYHA Class II and three improved to Class III.[5]

Cardiomyopathy/Post-Myocardial Infarction

A study was conducted on 10 post-myocardial-infarction patients and two ischemic cardiomyopathy patients, utilizing 500 mg bark extract every eight hours for three months, along with conventional treatment. Significant reductions in angina, left ventricular ejection fraction, and left ventricular mass were noted in the Terminalia group, whereas the control group taking only conventional drugs had decreased angina only. The two patients with cardiomyopathy improved from NYHA Class III to Class I during the study.[6]

Hyperlipidemia

Animal studies suggest Terminalia might reduce blood lipids. Rabbits made hyperlipidemic by feeding them an atherogenic diet were given an oral Terminalia extract. Animals given Terminalia had a significant, dose-related decrease in total- and LDL-cholesterol, compared to placebo ($p < 0.01$).[7] However, the amounts used (100 mg/kg and 500 mg/kg body weight) were very large, and it remains to be seen if these significant changes will be seen in humans taking relatively smaller oral doses.

In a similar study of rats fed cholesterol (25 mg/kg body weight) alone or along with Terminalia bark powder (100 mg/kg) for 30 days, Terminalia feeding caused a smaller increase in blood lipids and an increase in HDL cholesterol compared to the cholesterol-only group. The researchers felt inhibition of hepatic cholesterol biosynthesis, increased fecal bile acid excretion, and stimulation of receptor-mediated catabolism of LDL cholesterol caused Terminalia's lipid-lowering effects.[8]

Dosage and Toxicity

A typical dose of dried bark is 1-3 g/day, while 500 mg bark extract four times per day has been used in congestive heart failure. No toxicity has been documented.

References

1. Bone K. *Clinical Applications of Ayurvedic and Chinese Herbs*. Warwick, Queensland, Australia. Phytotherapy Press; 1996:131-133.
2. Kapoor LD. *Handbook of Ayurvedic Medicinal Plants*. Boca Raton, FL. CRC Press; 1990:319-320.
3. Singh N, Kapur KK, Singh SP, et al. Mechanism of cardiovascular action of *Terminalia arjuna*. *Planta Med* 1982;45:102-104.
4. Dwivedi S. Agarwal MP. Antianginal and cardioprotective effects of *Terminalia arjuna*, an indigenous drug, in coronary artery disease. *JAPI* 1994;42:287-289.
5. Bharani A, Ganguly A, Bhargave KD. Salutary effect of *Terminalia arjuna* in patients with severe refractory heart failure. *Int J Cardiol* 1995;49:191-199.
6. Dwivedi S, Jauhari R. Beneficial effects of *Terminalia arjuna* in coronary artery disease. *Indian Heart J* 1997;49:507-510.
7. Ram A, Lauria P, Gupta R, et al. Hypocholesterolaemic effects of *Terminalia arjuna* tree bark. *J Ethnopharmacol* 1997;55:165-169.
8. Khanna AK, Ramesh C, Kapoor NK. *Terminalia arjuna*: an Ayurvedic cardiotonic regulates lipid metabolism in hyperlipidaemic rats. *Phytotherapy Res* 1996;10:663-665.