

# How Physiotherapeutic and Yogic Interventions can be used for Treatment of Primary Hypertension?



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## Introduction

### Hypertension (HTN)

The leading risk factor for many diseases; has highest prevalence (~40%) in low and middle-income countries as per the estimates of world wide data by world health organization (WHO) [1]. It causes significant mortality -13.5% of total, [2] via cardio and cerebral injuries. A low cost and sustainable preventive solution, for this can be provided by yoga and physiotherapy. HTN is clinically defined as -increased systolic and diastolic blood pressures, the guidelines for which are ever evolving, albeit 140/90 mm of Hg, staying as a treatment target throughout this evolution [3].

HTN is the body's response to excessive stress - [4] of physical, psychological or pathological nature where the prana vayu (equivalent of disbursed oxygen) is chronically overconsumed by sympathomimetic components - in a chronic hyperactive state of body, mind and it disorients the life-force leading to afflictions of vyan vayu (equivalent of content of oxygen in arterial blood; due to vasoconstriction) in various organ systems [5]. It leads to disturbances of vata, pitta and couf by fluid overload.

Oxygen or Prana vayu delivery to tissues is the prime function, for survival and occupation. This is delivered to different body parts during different states of the bodily requirement and is the fine regulator for many autonomic nervous system parameters. However, contrary to the situation of HTN, in a state of rest, mediation, or during peaceful slumber the sympatholytic components get prana vayu, and there is abundance of vyan vayu in those areas. In HTN to compensate for lack of this, there is increased fluid overload, cardiac hypertrophy and marked renin-angiotensin-aldosterone adaptations.

Scientific application of yoga and physiotherapy have credible potential, for the treatment of primary hypertension [6-8]. Patient selection for these interventions shall be based on -uncomplicated cases without target organ damage, and with the ability to perform the practices of yoga and physiotherapy in asymptomatic manner.

The contraindications like retinopathy, nephropathy or significant cardiac abnormalities shall be ruled out.

Yogic practices like Shavasna, Anulomvilom pranayama, meditation with Om chanting and physiotherapy exercises like hold relax, Jacobson's relaxation, deep diaphragmatic breathing tune the autonomic control towards parasympathetic tone in general and decrease blood pressure noticeably [6]. As per the specificity, principle of yoga & exercise training the adaptations - of the cardiovascular system will be conditioned responses, that is the fine tuning of the reflex mechanism (autonomic modulation= heart rate variability (HRV) and baroreflex sensitivity (BS) as well as the hemodynamics of the cardiovascular system [9]. No activity / active rest, profound relaxation and psycho-physiological adaptability to stress is undoubtedly the key for its treatment. Low level of exercise (or the type that we use for physical activities) is shown to have no effect on arterial compliance, and by inducing increased flow it can have a greater increase in nitric oxide availability, tuning BS and SD improvements of HRV, which may explain post exercise hypotensive response [10]. This type of training may have a potential effect on the pathogenesis, as well as on the treatment of hypertension. In people with mild to moderate high blood pressure, studies have demonstrated that regular aerobic activity can decrease blood pressure by up to 10/8mm Hg [11].

Moreover, mild to moderate exercises are reported to suppress platelet adhesiveness and aggregation, whereas heavy exercises induce a transient increase in agonist-induced platelet aggregation, as well as increased platelet counts, adhesiveness and secretory activity. These effects seem to be more pronounced in sedentary than active healthy subjects, thus potentially explaining the risk of sudden death in susceptible sedentary individuals or in patients with pre-existing atherosclerotic vascular disease [12]. Certain yogic asanas like Halasan, Sarvangasna and Shirhsaasna divert the blood towards the central sinuses, it fine tunes the BS. Physiotherapeutic tilt table exercises and gravity assisted positions also perform the same function [6]. Suspension bed and

tilt table can be effectively used for this purpose. The re-setting of baroreflex is a new non-pharmacological intervention for the hypertension [6].

Suryanamaskar gives the prana vayu with pranic force of sunlight (related to vitamin D, nitric oxide and vagal predominance) with increased elasticity and flexibility, controlled breathing in the ample sunlight; similar benefits can be gained by artificial actinotherapy sources and passive stretching and breathing exercises. TL01 has been shown to be effective in reduction of BP, and improvement of vitamin D levels [13]. Sunlight but not vitamin D spectrum metabolites are known to have a vasoprotective effect on the blood pressure indices [14]. However, the unique combination only exists in the practice of Suryanamaskar, which helps to regulate and optimize the life-force - reflected in a decreased resting metabolic rate and higher  $VO_2$  max [15].

### Mechanism of antihypertensive effect of yoga and physiotherapy-

- A. Increased endothelium dependent vasodilatation through increased production of Nitric oxide [8]
- B. Reduced sympathetic nervous activity [16]
- C. Reduced arterial stiffness [17]
- D. Increased insulin sensitivity [18]
- E. Reduced lipid levels, abdominal fat independent of weight loss [19,20]
- F. Increased exercise capacity there by reducing symptoms at same workloads.

( $VO_2$ max=  $CO \times CaO_2 - CvO_2$  Increased capillarization may lead to increased  $VO_2$ max at same CO)  $VO_2$  max= maximum oxygen uptake; CO=cardiac output;  $CaO_2/CvO_2$ =content of oxygen in arterial or venous blood [21]. At present it is difficult to pinpoint the specific yogic kriya or asana or physiotherapy intervention to the specific mechanisms listed above [7]. To ensure safety monitoring of the following parameters shall be undertaken routinely-

1. Pulse/HR
2. SBP, DBP
3.  $SaO_2$
4. ECG (resting)
5. Borg's Scale of perceived exertion.
6. Aerobic fitness, 6 MWT D

Decrease in blood pressure, by short duration regular yogic practices is known to slow down and reverse the cognitive decline and improve mental function and quality of life [22-25]. Once BP starts to come back to lower and normal levels the antihypertensive medications shall be readjusted with the consultation of the experts.

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