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with secondary hypertension (due to renal, pulmonary, endocrine, or cardiovascular disease) also had arterial compression. Four of the 18 controls in this study showed compression. South Carolina researchers corroborated the findings of this study in 2005 when they observed a significant association between arterial compression of the ventrolateral medulla and essential hypertension.

Surgical intervention of compression has reduced blood pressure in hypertensive patients. A 1985 study, conducted by P. J. Jannetta et al., looked at blood pressure in patients who underwent surgery ("left retromastoid craniotomy and microvascular decompression") to treat cranial nerve dysfunctions. The surgeons found arterial compression of the left lateral medulla oblongata in 51 of 53 hypertensive patients but not in patients with normal blood pressure. After surgery, blood pressure was noticeably lower in 78% of the hypertensive patients.

A 2007 pilot study, conducted by George L. Bakris, MD, and colleagues, tested whether a nonsurgical procedure could also lower blood pressure in people with hypertension. The gentle National Upper Cervical Chiropractic (NUCCA) procedure is designed to correct malalignment of the atlas. The study hypothesis is based on the idea that compression of vertebral arteries occurs when the vertebra is malaligned. Correction of the atlas position would relieve compression and thereby reduce essential hypertension. The eight-week randomized study involved 50 people with stage I hypertension, none of whom were on antihypertensive medication. After randomly dividing the participants into two groups, the researchers assessed atlas alignment with X-rays and by checking the subjects' supine leg-length, posture, and paracervical skin temperature. According to chiropractic, a misaligned atlas results in leg-length disparities, apparent in comparisons of heel positions when the patient lies in a supine position. Disparities will change as the patient's head turns to the left or right if the atlas is misaligned. If no difference in leg-length exists or if no changes occur with head turning, the atlas is not out of alignment.

Half of the participants in this study received the NUCCA procedure consisting of light, precise nudges. The others underwent a sham procedure in which the clinician intentionally avoided the atlas's lateral-mass contact point. After the procedure, assessment of atlas alignment was repeated. About 85% of the treatment group maintained alignment after the first intervention for the entire eight weeks of the study. Blood pressure and pulse were taken during weekly visits. At the final visit, systolic blood pressure in the NUCCA group had decreased  $-17 \pm 9$  mm Hg compared with a decrease of  $-3 \pm 11$  mm Hg in the placebo group ( $P < 0.0001$ ). Diastolic blood pressure decreased  $-10 \pm 11$  mm Hg in the NUCCA compared with  $-2 \pm 7$  mm Hg in the control ( $P = 0.002$ ). "The improvement in BP following the correction of atlas misalignment is similar to that seen by giving two different antihypertensive agents simultaneously," the authors write in their article for the *Journal of Human Hypertension* (May

2007). Pulse rate did not change. The results need confirmed with a larger study that uses more than one practitioner, but this pilot study attests to the possibility that spinal manipulation can lower blood pressure in people with essential hypertension.

Akimura T, Furutani Y, Jimi Y et al. Essential hypertension and neural compression at the ventrolateral medulla oblongata: MR evaluation. *J Neuroradiol.* February 1995;16(2):401-405. Available at: [www.ajnr.org/ajnr reprint/16/2/401.pdf](http://www.ajnr.org/ajnr reprint/16/2/401.pdf). Accessed February 22, 2010.  
Bakris G, Dickholtz M, Meyer PM, et al. Achievement of blood pressure goals with atlas realignment. *J Clin Hypertens.* March 2007(Suppl A);18(5).  
Bakris G, Dickholtz M, Meyer PM, et al. Atlas vertebra realignment and achievement of arterial pressure goal in hypertensive patients: a pilot study. *J Hum Hypertens.* May 2007;21(5):347-352. Available at: [www.chiro.org/research/ABSTRACT/Atlas\\_Vertebra\\_Realignment.shtml](http://www.chiro.org/research/ABSTRACT/Atlas_Vertebra_Realignment.shtml). Accessed February 17, 2010.  
Coffee RE, Nicholas JS, Egan BM, Rumboldt Z, et al. Arterial compression of the olivary sulcus of the medulla in essential hypertension: a multivariate analysis [abstract]. *J Hypertens.* November 2005;23(11):2027-2031. Available at: [ncbi.nlm.nih.gov/pubmed/16208145](http://ncbi.nlm.nih.gov/pubmed/16208145). Accessed March 4, 2010.

### Stress Testing Before PCIs

Percutaneous coronary interventions (PCIs), such as angioplasty and stents, are designed to increase blood flow in plaque-occluded and weakened arteries. Recent studies indicate that PCIs are being performed in patients who are less likely to benefit from the procedures over the long run. When performed on people with nonemergent (stable) cardiovascular disease, such interventions relieve the pain of angina more quickly than medication. Lifestyle interventions but do not result in fewer heart

## Shorts

Senta Yamamoto and colleagues documented a correlation between the inflexibility that keeps us from touching our toes and arterial stiffness.

This 2009 cross-sectional study involved 526 nonobese Japanese adults (body mass index <30) with no sign of chronic disease, according to medical history, physical examination, complete blood chemistry, and hematological evaluation of total cholesterol level and blood sugar. None of the participants were on medication, showed signs of peripheral arterial disease, or had smoked within the previous four years. Participants were divided into three age categories: young (20–39 years), middle-aged (40–59 years), older (60–83 years). Persons in each age group were subdivided into a poor- or a high-flexibility group, based on performance in a sit-and-reach test. Right and left brachial-ankle pulse wave velocity (baPWV) was used to assess stiffness in the central arteries. The researchers also measured the participants' leg extension power (to assess muscle strength) and peak oxygen uptake (to assess cardiorespiratory fitness).

The researchers found that better flexibility is associated with less arterial stiffening in middle-aged and older people. No correlations were observed in the young group of subjects. Upon further analysis, the researchers discovered that age, cardiorespiratory fitness, muscular strength, and flexibility correlate independently with baPWV, which reflects arterial stiffness. "The interaction among flexibility and other components of fitness or physical activity in determining the arterial stiffness awaits further studies."

The possibility that flexibility alone affects arterial stiffening is reflected in a study by M. Y. Cortez-Cooper et al. (*Eur J Cardiovasc Prev Rehabil.* 2008;15:149–155). The study was designed to test the effect of strength training on arterial flexibility in middle-aged and older adults. The study unexpectedly showed that stretching exercise, as well as strength training, "significantly increased carotid arterial compliance." K. Yamamoto and colleagues suggest that a program of stretching exercise, yoga, or Pilates may improve arterial flexibility as well. An intervention study is needed to show that an exercise program that improves structural flexibility will also lessen arterial stiffness.

Yamamoto K, Kawano H, Gando Y, Iemitsu M et al. Poor trunk flexibility is associated with arterial stiffening. *Am J Physiol Heart Circ Physiol.* October 2009;297:H1314–H1318. First published August 7, 2009. Available at [ajph.heart.physiology.org](http://ajph.heart.physiology.org). Accessed February 17, 2010.

### Gender Differences in Heart Disease

Heart disease is the leading cause of death in both men and women; but symptoms, diagnosis strategies, effective treatments, even risk factors can differ according to gender. High LDL levels (over 130 mg/dL), for example, correlate with a higher risk of heart attack in men. In contrast, low HDL levels (below 50 mg/dL) and high triglyceride levels (over 150 mg/dL) are more significant in women: Women

are more likely to have conditions, such as lupus, that produce ongoing, low-grade inflammation. Chronic inflammation is believed to contribute to accumulation of atherosclerotic plaque. Having diabetes or any three of the five symptoms of metabolic syndrome (high triglycerides, low HDL, high blood pressure, abdominal obesity, and high blood sugar or insulin resistance) increases a woman's chance of a fatal heart attack more than a man's: "... diabetes more than doubles the risk of a cardiac death in women, while raising it 60% in men," according to Harvard Medical School's *HEALTHbeat*. Stress, a large waistline (35 inches or more in women and 40 inches or more in men), and cigarette smoking are equal-opportunity contributors to heart disease. (However, women who smoke and also use birth control pills are more likely to have a heart attack or stroke than women who simply smoke.)

Diagnosis of cardiovascular disease is more difficult in women than in men, partly because women tend to have less-obvious symptoms. Chest pain, along with nausea and sweating, is the classic sign of cardiovascular disease. While women with CVD do experience chest pain and angina, they also have "unconventional" symptoms like fatigue, malaise, shortness of breath, and depression more often than men. Nuclear stress tests that track blood flow to the heart (before and after treadmill exercise) are more reliable in women than an ECG stress test that records electrical conduction.

If a stress test is positive, the next step is an angiogram (an X-ray of the heart and blood vessels) to look for blockages. Conventional medicine treats blockages with angioplasty or bypass surgery. Women, however, are more likely to have microvascular disease, which is hard to detect with angiography. Coronary flow reserve studies and intravascular ultrasound of the coronary artery are used to assess blood flow in small vessels and to identify arteries that are uniformly narrowed by plaque. Unlike overt blockages, the conventional treatment for microvascular disease and uniformly narrowed coronary arteries consists of medication and lifestyle changes (e.g., diet, exercise, smoking cessation).

Harvard Medical School. His and hers heart disease. Part 1 [web page]. Harvard Health Publications. February 9, 2010. Available at [www.health.harvard.edu](http://www.health.harvard.edu). Accessed February 12, 2010.

Harvard Medical School. His and hers heart disease. Part 2 [web page]. Harvard Health Publications. February 23, 2010. Available at [www.health.harvard.edu](http://www.health.harvard.edu). Accessed February 23, 2010.

### Hypertension and the Atlas Vertebra

Compression of arteries feeding the ventrolateral medulla (located in the brainstem near the atlas vertebra at the top of the spinal column) has been linked to hypertension. This relationship between circulatory abnormalities and hypertension in a subset of patients has been reported in studies for decades. In a 1994 Japanese study, for example, magnetic resonance imaging was used to evaluate the relationship between the upper ventrolateral medulla and vertebral arteries and arterial branches. Twenty-nine of the 32 people with essential hypertension (no known cause) showed arterial compression. One of the six people

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