Collected Scientific Research Relating to the Use of Osteopathy with Blood supply and circulation

Important:

1) Osteopathy involves helping people's own self-healing abilities to work better, rather that focussing primarily on particular conditions.

2) Each person is different, and osteopathy treats them differently.

Therefore people respond to osteopathic treatment in different ways. Treatments that work for one person cannot be guaranteed to work for another person in the same way. The fact that there is scientific research supporting a treatment in a group of people does not mean that it will always work in the same way (which is probably true of all research).

A number of things make research into osteopathy challenging. These include the two aspects of osteopathy mentioned above, and also the lack of major commercial interests to provide funding in expectation of financial returns. At the same time, there is an emerging body of research demonstrating the usefulness of osteopathic treatment.

Please note: there is room for debate about the classifications used for these studies. Please let John Smartt know if you believe that any of these classifications are incorrect.

These studies are from peer-reviewed journals

Number of studies: 20

Clinically and statistically significant results

Number of studies: 19

Systematic reviews

Number of studies: 1

Galindez-Ibarbengoetxea X, Setuain I, Andersen LL, Ramírez-Velez R, González-Izal M, Jauregi A,, Izquierdo M 2017 **Effects of Cervical High-Velocity Low-Amplitude Techniques on Range of Motion, Strength Performance, and Cardiovascular Outcomes: A Review.** J Altern Complement Med Sep;23(9):667-675 *https://www.ncbi.nlm.nih.gov/pubmed/28731832*

"BACKGROUND:
Cervical high-velocity low-amplitude (HVLA) manipulation technique is among the oldest and most frequently used chiropractic manual therapy, but the physiologic and biomechanics effects were not completely clear.
OBJECTIVE:
This review aims to describe the effects of cervical HVLA manipulation techniques on range of motion, strength, and cardiovascular performance.
METHODS/DESIGN:
A systematic search was conducted of the electronic databases from January 2000 to August 2016: PubMed (n = 131), ScienceDirect (n = 101), Scopus (n = 991), PEDro (n = 33), CINAHL (n = 884), and SciELO (n = 5). Two independent reviewers conducted the screening process to determine article eligibility. The intervention that included randomized controlled trials was thrust, or HVLA, manipulative therapy directed to the cervical spine. Methodological quality was assessed using the Cochrane risk-of-bias tool. The initial search rendered 2145 articles. After screening titles and abstracts, 11 articles remained for full-text review.
RESULTS:
The review shows that cervical HVLA manipulation treatment results in a large effect size (d > 0.80) on increasing cervical range of motion and mouth opening. In patients with lateral epicondylalgia, cervical HVLA manipulation resulted in increased pain-free handgrip strength, with large effect sizes (1.44 and 0.78, respectively). Finally, in subjects with hypertension the blood pressure seemed to decrease after cervical HVLA manipulation. Higher quality studies are needed to develop a stronger evidence-based foundation for HVLA manipulation techniques as a treatment for cervical conditions."

Randomised controlled trials

Number of studies: 10

Yung EY, Oh C, Wong MS, Grimes JK, Barton EM, Ali MI, Cameron D 2017 **The immediate cardiovascular response to joint mobilization of the neck - A randomized, placebo-controlled trial in pain-free adults.** Musculoskelet Sci Pract Apr;28:71-78 *https://www.ncbi.nlm.nih.gov/pubmed/28219804*

> "Some normotensive patients can have a spike in resting systolic blood pressure (SBP) in response to acute neck pain. Applying the typical dosage of mobilization may potentially result in a sympatho-excitatory response, further increasing resting SBP. Therefore, there is a need to explore other dosage regimens that could result in a decrease in SBP.
> OBJECTIVES:To compare the blood pressure (BP) and heart rate (HR) response of pain-free, normotensive adults when receiving unilateral posterior-to-anterior mobilization (PA) applied to the neck versus its corresponding placebo (PA-P).
> STUDY DESIGN: Double-Blind, Randomized Clinical Trial.
> METHODS: 44 (18 females) healthy, pain-free participants (mean age, 23.8 ± 3.04 years) were randomly allocated to 1 of 2 groups. Group 1 received a PA-P in which light touch was applied to the right 6th cervical vertebra. Group 2 received a PA to the same location. BP and HR were measured prior to, during, and after the application of PA or PA-P. A mixed-effect model of repeated measure analysis was used for statistical analysis.
> RESULTS: During-intervention, the PA group had a significant reduction in SBP, while the placebo group had an increase in SBP. The change in SBP during-intervention was significantly different between the PA and the placebo group (p-value = 0.003). There were no significant between-group differences found for HR and diastolic BP (DBP). The overall group-by-time interaction was statistically significant for SBP (p-value = 0.01).
> CONCLUSIONS: When compared to placebo, the dosage of applied PA resulted in a small, short-lived drop in SBP not exceeding the minimal detectable change"

Shah Y, Arkesteijn M, Thomas D, Whyman J, Passfield L 2017 **The acute effects of integrated myofascial techniques on lumbar paraspinal blood flow compared with kinesio-taping: A pilot study.** J Bodyw Mov Ther Apr;21(2):459-467 *https://www.ncbi.nlm.nih.gov/pubmed/28532891*

> "Myofascial techniques and Kinesio Taping are therapeutic interventions used to treat low back pain. However, limited research has been conducted into the underlying physiological effects of these types of treatments.
> OBJECTIVES:
> The purpose of this study was to compare the acute effects of integrated myofascial techniques (IMT) and Kinesio Tape (KT) on blood flow at the lumbar paraspinal musculature.
> METHODS:
> Forty-four healthy participants (18 male and 26 female) (age, 26 ± SD 7) volunteered for this study and were randomly assigned to one of three interventions, IMT, KT or a control group (Sham TENS). Paraspinal blood flow was measured at the L3 vertebral level, using Near Infrared Spectroscopy (NIRS), before and after a 30-min treatment. Pain Pressure Threshold (PPT) was also measured before and after treatments.
> RESULTS:
> A one-way ANOVA indicated a significant difference between groups for O2Hb [F (2-41) = 41.6, P < 0.001], HHb [F (2-41) = 14.6, P < 0.001] and tHb [F (2-41) = 42.2, P < 0.001]. Post hoc tests indicated that IMT was significantly greater, from the KT and the control treatments (P < 0.001), for changes in O2Hb, HHb, and tHb. There were no significant differences for PPT [F (2-41) = 2.69, p = 0.08], between groups.
> CONCLUSIONS:
> This study demonstrated that IMT increases peripheral blood flow at the paraspinal muscles in healthy participants compared to KT and sham TENS. The change in blood flow had no impact on pain perception in the asymptomatic population group."

Zegarra-Parodi R, Pazdernik VK, Roustit M, Park PY, Degenhardt BF 2016 **Effects of pressure applied during standardized spinal mobilizations on peripheral skin blood flow: A randomised cross-over study.** Manual Therapy Feb;21:220-6 *http://www.ncbi.nlm.nih.gov/pubmed/26343747*

> "Peripheral skin blood flow (SBF) changes during and after spinal mobilization (SM), evaluated with laser Doppler flowmetry, may document physiological responses associated with SM."
> "The current study is the first to describe bilateral peripheral SBF changes occurring during and 5 min after application of standardized SMs. Our post-SM vasodilation suggests involvement of mechanisms other than the putative SSNA-excitatory mechanism proposed with skin conductance measurements. Persistence of post-SM vasodilation following only high-pressure SM suggests possible pressure-dependent mechanisms. However, further research is warranted to clarify our findings."

Crisóstomo RS, Costa DS, Martins L, Fernandes TI, Armada-da-Silva PA. 2015 **Influence of manual lymphatic drainage on health-related quality of life and symptoms of chronic venous insufficiency: a randomized controlled trial.** Arch Phys Med Rehabil Feb;96(2):283-91 *https://www.ncbi.nlm.nih.gov/pubmed/25308883*

> "OBJECTIVE:
> To evaluate the efficacy of manual lymphatic drainage (MLD) in improving health-related quality of life (HRQOL), symptomatology, and physical status in patients with chronic venous insufficiency (CVI).
> DESIGN:
> Single-blind randomized controlled trial.
> SETTING:
> Health community attendant service.
> PARTICIPANTS:
> Subjects with CVI (N=41) were randomly assigned to an experimental group (n=20; mean age, 54.6±11.3y) or control group (n=21; mean age, 46.8±11.1y).
> INTERVENTIONS:
> The experimental group completed 10 lower extremity MLD sessions over 4 weeks and 1 educational session. The control group only attended the educational session. Outcome measures were taken at baseline (t0), at the end of 4 weeks (t1), and after 2 months for follow-up (t2).
> MAIN OUTCOME MEASURES:
> HRQOL was assessed with the Chronic Venous Insufficiency Quality of Life Questionnaire-20, symptoms (fatigue, heaviness) were assessed with a visual analog scale, severity of the disease was assessed with the Venous Clinical Severity Score (VCSS) (total score, score for each item), leg volumetry was assessed with perimeters, and plantar/dorsiflexion strength and ankle range of motion (ROM) were assessed with dynamometry.
> RESULTS:
> A significant interaction group×time effect was found for pain on HRQOL ($F_{2,78}=3.507$; $P=.035$; partial $\eta^2=.087$), clinical severity ($F_{2,78}=5.231$; $P=.007$; partial $\eta^2=.118$), especially for venous edema (assessed with the VCSS), fatigue ($F_{1.67,65.21}=4.690$; $P=.012$; partial $\eta^2=.107$), and heaviness ($F_{1.57,61.32}=9.702$; $P=.001$; partial $\eta^2=.199$), with the experimental group improving from t0 to t1 and t0 to t2 in all of these outcomes. No effect of MLD treatment could be found for ankle muscle strength, ankle ROM, and leg volume.
> CONCLUSIONS:
> Short-term MLD treatment ameliorates CVI severity and related edema, symptoms, and pain HRQOL in patients with CVI."

Dos Santos Crisóstomo RS, Candeias MS, Ribeiro AM, da Luz Belo Martins C, Armada-da-Silva PA. 2014 **Manual lymphatic drainage in chronic venous disease: a duplex ultrasound study.** Phlebology Dec;29(10):667-76 *http://www.ncbi.nlm.nih.gov/pubmed/23989970*

> "Manual lymphatic drainage increases the venous blood flow in the lower extremity with a magnitude that is independent from the specific maneuver employed or the presence of chronic

venous disease."

Shi X, Rehrer S, Prajapati P, Stoll ST, Gamber RG, Downey HF. 2011 **Effect of cranial osteopathic manipulative medicine on cerebral tissue oxygenation.** J Am Osteopath Assoc Dec;111(12):660-6. *https://www.ncbi.nlm.nih.gov/pubmed/22182951*

> "Cranial OMM [osteopathic manipulative medicine] augmentation and suppression techniques and sham therapy were randomly applied to healthy adults. During cranial OMM and sham therapy, S(CT)O(2) of the prefrontal cortex was determined bilaterally by using near-infrared spectroscopy. Heart rate, blood pressure, and systemic arterial blood oxygen saturation (SaO (2)) were also measured."
> "The cranial OMM suppression technique effectively and progressively reduced S(CT)O(2) in both prefrontal lobes with the treatment time."

Sergueef N, Nelson KE, Glonek T 2002 **The effect of cranial manipulation on the Traube-Hering-Mayer oscillation as measured by laser-Doppler flowmetry.** Altern Ther Health Med. Nov-Dec;8(6):74-6. *http://www.ncbi.nlm.nih.gov/pubmed/12440842*

> "Immediately following the procedures, a 5-min posttreatment laser-Doppler recording was acquired. For each cranial treatment subject, the 4 major components of the blood-flow velocity record, the thermal (Mayer) signal, the baro (Traube-Hering) signal, the respiratory signal, and the cardiac signal, were analyzed, and the pretreatment and post treatment data were compared."
> "Cranial manipulation affects the blood-flow velocity oscillation in its low-frequency Traube-Hering-Mayer components. Because these low-frequency oscillations are mediated through parasympathetic and sympathetic activity, it is concluded that cranial manipulation affects the autonomic nervous system."

Perrin RN, Edwards J, Hartley P 1998 **An evaluation of the effectiveness of osteopathic treatment on symptoms associated with Myalgic Encephalomyelitis. A preliminary report** Journal of Medical Engineering & Technology January/February

> "The term Myalgic Encephalomyelitis (ME) was initially used in the 1950s. ME describes a syndrome where there is general muscle pain associated with evidence of a disturbed nervous system. ME, commonly referred to as Chronic Fatigue Syndrome (CFS), or post-viral fatigue syndrome is a condition in which mental and physical fatigue predominate. It is characterized by gross abnormal muscle fatigue which occurs after relatively mild activity. Other symptoms regularly complained of include sleep disturbance, headaches, cognitive dysfunction, feeling depressed, bouts of low grade fever (not exceeding 38.6C),increased sensitivity to light, back and neck pain, sore throat, irritable bowel and bladder. The symptoms of ME typically become apparent following a viral infection"
> "There has been a long-standing debate over the naming of this disorder. Some have expressed the opinion that ME is a highly specific disease, whereas CFS is an umbrella term covering many conditions which exhibit fatigue."
> "The treatment of each ME patient consisted of the following techniques:
> (1)Soft tissue massage of the paravertebral muscles, the trapezii, levator scapulae, rhomboids and muscles of respiration.
> (2) High and low velocity manipulation of the thoracic and upper lumbar spinal segments using supine and side-lying combined leverage and thrust techniques.
> (3) Gentle articulation of thoracic and upper lumbar spine, plus the ribs. This was achieved by both long and short lever techniques.
> (4)Functional techniques to the suboccipital region and the sacrum.
> (5)Stimulation of the cranio-sacral rhythm by functional-cranial techniques.
> (6)Efflourage to aid drainage in thoracic and cervical lymphatic vessels.
> (7)Exercises to improve the mobility of the thoracic spine, and to improve the physical coordination."
> "Our hypothesis, based on clinical evidence, is that following osteopathic treatment the symptoms are reduced due to stabilizing nffment sympathetic flow. It is believed by the authors

that this equilibrium may be achieved due to relaxation of soft tissue and an improvement in visceral function plus increased blood and lymph circulation."
"This present study has revealed a demonstrable improvement in ME symptoms as a result of osteopathic treatment."

Molski P, Ossowski R, Hagner W, Molski S. 2009 **Patients with venous disease benefit from manual lymphatic drainage.** Int Angiol Apr;28(2):151-5. *http://www.ncbi.nlm.nih.gov/pubmed/19367246*

"After surgery, the MLD [manual lymphatic drainage] group had significantly better results than the control group in CEAP score (P<0.05) and had comparable results for QoL [quality of life]. MLD improved (P<0.05) VRI, CEAP score, anxiety and depression states. MLD [manual lymphatic drainage] can be an alternative or a supplementary procedure for patients surgically treated."

Jardine WM, Gillisb C, Rutherford D, 2012 **The effect of osteopathic manual therapy on the vascular supply to the lower extremity in individuals with knee osteoarthritis: A randomized trial** International Journal of Osteopathic Medicine Volume 15, Issue 4, December , Pages 125–133 *http://www.sciencedirect.com/science/article/pii/S1746068912000466*

"Results: The RI [resistive index of the superficial femoral artery] reduced significantly ($p < 0.008$) from pre to post test in the treatment group only. Significant pretest/posttest main effects were found for ROM, balance and symptom rating ($p < 0.05$). Conclusion: The significant difference in RI provides evidence for the benefits of specificity within osteopathic techniques, and reveal the vascular supply to the leg was affected by the fascial releases and will possibly influence some of the pathophysiological factors of an arthritic knee."

Case contolled studies

Number of studies: 3

Lombardini R, Marchesi S, Collebrusco L, Vaudo G, Pasqualini L, Ciuffetti G, Brozzetti M, Lupattelli G, Mannarino E 2009 **The use of osteopathic manipulative treatment as adjuvant therapy in patients with peripheral arterial disease** Manual Therapy Volume 14, Issue 4, August , Pages 439–443 *http://www.sciencedirect.com/science/article/pii/S1356689X08001367*

"Peripheral arterial disease (PAD) is a manifestation of systemic atherosclerosis associated with impaired endothelial function and intermittent claudication is the hallmark symptom. Hypothesizing that osteopathic manipulative treatment (OMT) may represent a non-pharmacological therapeutic option in PAD, we examined endothelial function and lifestyle modifications in 15 intermittent claudication patients receiving osteopathic treatment (OMT group) and 15 intermittent claudication patients matched for age, sex and medical treatment (control group). Compared to the control group, the OMT group had a significant increase in brachial flow-mediated vasodilation, ankle/brachial pressure index, treadmill testing and physical health component of life quality (all $p < 0.05$) from the beginning to the end of the study. At univariate analysis in the OMT group there was a negative correlation between changes in brachial flow-mediated vasodilation and IL-6 levels ($r = -0.30$; $p = 0.04$) and a positive one between claudication pain time and physical function score ($r = 0.50$; $p = 0.05$). In conclusion, despite the relatively few patients in our study, these results suggest that OMT significantly improves endothelial function and functional performance in intermittent claudication patients along with benefits in quality of life. This novel treatment combined with drug and lifestyle modification might be an effective alternative to traditional training based on exercise."

Nelson KE, Sergueef N, Glonek T. 2006 **The effect of an alternative medical procedure upon low-frequency oscillations in cutaneous blood flow velocity.** Journal of Manipulative and Physiological Therapeutics Oct;29(8):626-36 *http://www.ncbi.nlm.nih.gov/pubmed/17045096*

"Human subjects were paired with 28 individual physicians for application of the CV-4 [compression of the 4th ventricle], and the duration of the application was recorded. Flowmetry records tracking the course of the procedure were obtained."
"The CV-4 procedure specifically affected the low-frequency oscillations in blood flow velocity. After application, the amplitude of the TH, 0.10 Hz, frequency wave increased (relative area units: control minus treatment [0.08010 units) compared with control minus response [-0.03358 units]; P = .011)."
"This study showed that CV-4 has an effect on the TH frequency component of blood flow velocity. The practitioners of cranial manipulation who participated in this study affected their subjects in a quantifiable manner with the application of the CV-4 procedure."

Nelson KE, Sergueef N, Glonek T 2004 **Cranial Manipulation Induces Sequential Changes in Blood Flow Velocity on Demand** The AAO Journal September, 15-17

"Methods: Using laser-Doppler flowmetry to quantify the TH and other components of the blood flow velocity oscillation, we compared flowmetry records of 15 subjects before and immediately following cranial manipulation. The timing of the treatment/non-treatment sequence was established prior to manipulative inter- vention. Results: Selected continuous record segments from within treatment and non-treatment portions of the experimental flowmetry records were converted to frequency-domain spectra via a Fourier-transformation (FT). From the FT data, difference spectra were computed by subtracting the spectrum acquired during a non-treatment segment from the spectrum of adjacent treatment-period records. The resultant difference showed that cranial manipulative treatment enhanced the magnitude of the 0.1 Hz component and increased the fundamental heart rate. No other prominent changes with treatment were observed. Conclusions: Flowmetry shows that cranial manipulation may be used to alter the 0.1 Hz blood flow component of the TH oscillation according to a pre-determined protocol. Thus, cranial manipulation may be used to alter blood flow according to specific interventional directives."

Other controlled clinical trials

Number of studies: 4

Crisóstomo RS, Candeias MS, Armada-da-Silva PA. 2017 **Venous flow during manual lymphatic drainage applied to different regions of the lower extremity in people with and without chronic venous insufficiency: a cross-sectional study.** Physiotherapy Mar;103(1):81-89 *https://www.ncbi.nlm.nih.gov/pubmed/27083323*

> "To evaluate the effect of manual lymphatic drainage (MLD) on venous flow when applied to the medial and lateral aspects of the thigh and leg in patients with chronic venous insufficiency (CVI) and healthy subjects.
> DESIGN:
> Cross-sectional study.
> SETTING:
> Participants were assessed in a school-based health community attendant service.
> PARTICIPANTS:
> Fifty-seven subjects participated in this study {mean age: 43 [standard deviation (SD) 14] years, 38 women and 19 men}. Of these, 28 subjects had CVI [mean age 47 (SD 12) years] and 29 subjects did not have CVI [mean age 39 (14) years].
> INTERVENTION:
> MLD was applied by a certificated physical therapist to the medial and lateral aspects of the thigh and leg.
> MAIN OUTCOME MEASUREMENTS:
> Cross-sectional area; blood flow velocities in the femoral vein, great saphenous vein, popliteal vein and small saphenous vein at baseline and during MLD, measured by duplex ultrasound.
> RESULTS:
> Flow volume in the femoral vein increased from baseline [5.19 (SD 3.25)cm3/second] when MLD was applied to the medial [7.03 (SD 3.65)cm3/second; P≤0.001; mean difference -1.69; 95% confidence interval (CI) -2.42 to -0.97] and lateral [6.16 (SD 3.35)cm3/second; P≤0.001; mean difference -1.04; 95% CI -1.70 to -0.39] aspects of the thigh. Venous flow augmentation in the femoral vein and great saphenous vein was higher when MLD was applied to the medial aspect of the thigh (P<0.001), while MLD had a similar effect on venous blood flow regardless of whether it was applied to the medial or the lateral aspect of the leg (P=0.731).
> CONCLUSIONS:
> MLD increases blood flow in deep and superficial veins. MLD should be applied along the route of the venous vessels for improved venous return."

Leduc O, Crasset V, Leleu C, Baptiste N, Koziel A, Delahaie C, Pastouret F, Wilputte F, Leduc A. 2011 **Impact of manual lymphatic drainage on hemodynamic parameters in patients with heart failure and lower limb edema.** Lymphology Mar;44(1):13-20. *https://journals.uair.arizona.edu/index.php/lymph/article/view/17022*

> "Since 1990, it has been thought that ISPT [intermittent sequential pneumatic therapy] applied to both lower limbs simultaneously should not be used for patients with heart failure because right atrial, pulmonary arterial, and pulmonary wedge pressures may increase to a critical point. "
>
> "MLD [manual lymphatic drainage] treatment significantly decreased the limbs as expected. The heart rate also decreased following MLD in contrast with all other hemodynamic parameters which were not affected by MLD. The findings suggest that there is no contraindication to use MLD in patients with heart failure and lower limb edema."

O-Yurvati AH, Carnes MS, Clearfield MB, Stoll ST, McConathy WJ. 2005 **Hemodynamic effects of osteopathic manipulative treatment immediately after coronary artery bypass graft surgery.** J Am Osteopath Assoc Oct;105(10):475-81 *http://www.ncbi.nlm.nih.gov/pubmed/16314680*

> "The primary assessment compared, pre-OMT [ostoepathic manipulative therapy] versus post-

OMT, measurements of thoracic impedance, mixed venous oxygen saturation (SvO2), and cardiac index. Records of control subjects (n=19) who underwent CABG surgery--but who did not receive OMT--were assessed for SvO2 and cardiac index at 1 hour and 2 hours postsurgery."
"Immediately following CABG [coronary arterial bypass graft] surgery (< or = 2 h), OMT was provided to subjects to alleviate anatomic dysfunction of the rib cage caused by median sternotomy and to improve respiratory function. This adjunctive treatment occurred while subjects were completely anesthetized."
"A post-OMT increase in thoracic impedance (P < or = .02) in OMT subjects demonstrated that central blood volume was reduced after OMT, suggesting an improved peripheral circulation. Mixed venous oxygen saturation also increased (P < or = .005) after OMT. These increases were accompanied by an improvement in cardiac index (P < or = .01). Comparisons of postoperative measurements in OMT subjects versus those in control subjects revealed statistically significant differences for SvO2 (P < or = .005) and cardiac index (P < or = .02) between the two groups."
"The observed changes in cardiac function and perfusion indicated that OMT had a beneficial effect on the recovery of patients after CABG surgery. The authors conclude that OMT has immediate, beneficial hemodynamic effects after CABG surgery when administered while the patient is sedated and pharmacologically paralyzed."

Karason AB, Drysdale IP 2003 **Somatovisceral response following osteopathic HVLAT: a pilot study on the effect of unilateral lumbosacral high-velocity low-amplitude thrust technique on the cutaneous blood flow in the lower limb** Journal of Manipulative and Physiological Therapeutics Volume 26, Issue 4, May , Pages 220–225 *http://www.sciencedirect.com/science/article/pii/S0161475402541105*

"Twelve nonsmoking subjects, who received a successful HVLAT manipulation, showed a significant increase (P < .001) in blood perfusion, both ipsilaterally and contralaterally. Six smokers responded with a significant decrease in blood flow ipsilaterally (P < .01) and contralaterally (P < .001) after HVLAT manipulation."
"The results from this study support previous published hypotheses that spinal adjustments outside the region of the sympathetic outflow result in an increase in cutaneous blood flow."

Cohort studies

Number of studies: 1

Cerritelli F, Carinci F, Pizzolorusso G, Turi P, Renzetti C, Pizzolorusso F, Orlando F, Cozzolino V, Barlafante G 2011 **Osteopathic manipulation as a complementary treatment for the prevention of cardiac complications: 12-Months follow-up of intima media and blood pressure on a cohort affected by hypertension.** Journal of Bodywork and Movement Therapies Jan;15(1):68-74 *http://www.bodyworkmovementtherapies.com/article/S1360-8592(10)00046-X/references*

This was a time-series study. At the same time, this is a condition who's natural history would not normally involve spontaneous improvement, and so therefore it should not be trusted on its own without repetition with a control group.

"Background
Aim of the present study was to investigate the association between osteopathic treatment and hypertension.
Methods
The design was a non-randomized trial including consecutive subjects affected by hypertension and vascular alterations, using pre–post differences in intima-media thickness, systolic and diastolic blood pressure as primary endpoints. Statistical analysis was based on univariate t tests and multivariate linear regression.
Results
A total of N = 31 out of N = 63 eligible subjects followed by a single cardiologist received osteopathic treatment in addition to routine care. Clinical measurements were recorded at baseline and after 12 months.
Univariate analysis found that osteopathic treatment was significantly associated to an improvement in all primary endpoints. Multivariate linear regression showed that, after adjusting for all potential confounders, osteopathic treatment was performing significantly better for intima-media thickness (delta between pre–post differences in treated and control groups: −0.517; 95% c.i.: −0.680, −0.353) and systolic blood pressure (−4.523; −6.291, −2.755), but not for diastolic blood pressure.
Conclusion
Our study shows that, among patients affected by cardiovascular disorders, osteopathic treatment is significantly associated to an improvement in intima-media and systolic blood pressure after one year. Multicentric randomized trials of adequate sample size are needed to evaluate the efficacy of OMT in the treatment of hypertension."

Mixed results (significant for some outcomes, not others)

Number of studies: 1

Randomised controlled trials

Number of studies: 1

Hensel KL, Pacchia CF, Smith ML, 2013 **Acute improvement in hemodynamic control after osteopathic manipulative treatment in the third trimester of pregnancy** Complementary Therapies in Medicine Volume 21, Issue 6, December , Pages 618–626 *http://www.sciencedirect.com/science/article/pii/S0965229913001301*

"Summary
Objectives
The physiological changes that occur during pregnancy, including increased blood volume and cardiac output, can affect hemodynamic control, most profoundly with positional changes that affect venous return to the heart. By using Osteopathic Manipulative Treatment (OMT), a body-based modality theorized to affect somatic structures related to nervous and circulatory systems, we hypothesized that OMT acutely improves both autonomic and hemodynamic control during head-up tilt and heel raise in women at 30 weeks gestation.
Design
One hundred subjects were recruited at 30 weeks gestation.
Setting
The obstetric clinics of UNTHealth in Fort Worth, TX.
Intervention
Subjects were randomized into one of three treatment groups: OMT, placebo ultrasound, or time control. Ninety subjects had complete data (N = 25, 31 and 34 in each group respectively).
Main outcome measures
Blood pressure and heart rate were recorded during 5 min of head-up tilt followed by 4 min of intermittent heel raising.
Results
No significant differences in blood pressure, heart rate or heart rate variability were observed between groups with tilt before or after treatment ($p > 0.36$), and heart rate variability was not different between treatment groups ($p > 0.55$). However, blood pressure increased significantly ($p = 0.02$) and heart rate decreased ($p < 0.01$) during heel raise after OMT compared to placebo or time control.
Conclusions
These data suggest that OMT can acutely improve hemodynamic control during engagement of the skeletal muscle pump and this was most likely due to improvement of structural restrictions to venous return."

It is unclear whether the following journals are peer-reviewed

Number of studies: 2

Clinically and statistically significant results

Number of studies: 2

Randomised controlled trials

Number of studies: 1

Farthing RJ, Gosling CM, Vaughan B 2005 **The effects of slow rib raising on heart rate, blood pressure, respiration rate and pain pressure threshold** Osteopathic Medicine, School of Health Sciences, Victoria University, Melbourne (unpublished thesis) *http://vuir.vu.edu.au/795/1/Farthing_et.al_2005.pdf*

> "Objective To determine whether rib raising over the costotransverse joints at a slow rate (0.5hz, 30/min) can affect indicators of SNS [sympathetic nervous system] function by producing changes in heart rate, respiratory rate, blood pressure and pain pressure threshold.
> Design Randomized, cross-over, single blind, placebo controlled design in which participants experienced all three treatment conditions (rib raising treatment, placebo treatment and control treatment).
> Subjects Thirty asymptomatic and apparently healthy participants (age 22.4 ± 2.75yrs) were voluntarily recruited from the Victoria University Osteopathic Medicine Student Clinic.
> Method Participants were randomly allocated to receive a treatment condition for three sessions with weekly intervals between treatment sessions. All treatment modalities were experienced by the participants. Baseline measures for heart rate (HR), respiratory rate (RR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and pain pressure threshold (PPT) were recorded initially and repeated after two treatment interventions and after two rest periods.
> Results
> Analysis with five separate one way analysis of variance (ANOVA) with a priori comparisons revealed stastically significant interactions between groups for RR ($F(2,87)= 7.02$, $P= 0.001$), DBP ($F(2,87)= 3.51$, $P= 0.03$) and PPT ($F(2,87)= 3.51$, $P=0.03$). Increases were also observed for HR and SBP although these results were not stastically significant.
> Conclusions
> Mobilization of the ribs 1-6 at a slow rate (0.5hz, 30 cycles per minute) in asymptomatic patients produced stastically significant increases in RR, DBP and PPT. These changes were compared to the control and placebo groups in which little to minimal changes were observed."

Case series

Number of studies: 1

Burns L 1907 **The experimental demonstration of the osteopathic centers: the heart** Studies in the Osteopathic Sciences: Basic Principles 1 *http://www.mcmillinmedia.com/eamt/files/burns1/bur1cont.html*

> "Stimulation of the tissues near the fourth thoracic spine caused an increase of as much as fifteen beats per minute in the pulse rate. In those persons in whom the rate was greatly increased, the force of each beat was somewhat lessened. The utmost efforts at stimulation were unable to increase the pulse rate at all in some individuals.
> In all, when efficient stimulation was given, the blood pressure was raised. This reaction was no doubt partly due to the simultaneous reflex stimulation of the pulmonary vaso-motors, and in part to the cardiac effects. The rise of blood pressure thus produced may amount to twenty millimeters of mercury in some individuals. In others, the effects are much less pronounced. Efficient stimulation always produces some change, however in a normal person.
> The effect of this stimulation upon the sphygmogram is usually very pronounced. In persons whose muscles are very heavy, and who have been of robust health for a long time, it requires a considerable amount of strength to effect the deeper muscles in sufficient degree to effect a perceptible change in the sphygmogram."
> " It appears from these experiments that the action of the heart may be affected by somato-sensory impulses from the area of distribution of the fourth thoracic nerves, and that those movements are most effectual which affect the relations of the joint surfaces.
> Abnormal conditions affecting the somato-sensory impulses carried over the third, fourth and fifth thoracic nerves may exert a direct influence upon the heart's action.
> Any condition which affects the sensory fibers of the vagus may affect the action of the heart."