

The Effect of Deep-Tissue Massage Therapy on Blood Pressure and Heart Rate

ALAN DAVID KAYE, M.D., Ph.D., D.A.B.P.M.,¹ AARON J. KAYE,¹
JAN SWINFORD,² AMIR BALUCH, M.D.,³ BRAD A. BAWCOM, B.S.,⁴
THOMAS J. LAMBERT, M.D.,⁵ and JASON M. HOOVER, M.D.⁶

ABSTRACT

Aim: In the present study, we describe the effects of deep tissue massage on systolic, diastolic, and mean arterial blood pressure.

Materials and methods: The study involved 263 volunteers (12% males and 88% females), with an average age of 48.5. Overall muscle spasm/muscle strain was described as either moderate or severe for each patient. Baseline blood pressure and heart rate were measured via an automatic blood pressure cuff. Twenty-one (21) different soothing CDs played in the background as the deep tissue massage was performed over the course of the study. The massages were between 45 and 60 minutes in duration. The data were analyzed using analysis of variance with *post-hoc* Scheffe's *F*-test.

Results: Results of the present study demonstrated an average systolic pressure reduction of 10.4 mm Hg ($p < 0.06$), a diastolic pressure reduction of 5.3 mm Hg ($p < 0.04$), a mean arterial pressure reduction of 7.0 mm Hg ($p < 0.47$), and an average heart rate reduction of 10.8 beats per minute ($p < 0.0003$), respectively.

Conclusions: Additional scientific research in this area is warranted.

INTRODUCTION

Alternative medicine covers a broad spectrum of medical approaches and therapies that, in general, have been ignored by health professionals in the past; however, recent studies demonstrate that 36% of the U.S. population currently use some form of alternative medicine.¹ In 1997, Americans spent \$27 billion for alternative therapies and made 627 million visits to alternative medicine practitioners. In contrast, only 386 million family practice visits were made.² The scientific community has progressively become more aware of the physiologic and remedial effects of alternative medical treatments, and, as a result, some of these practices are now being reimbursed by health insurance

companies and used during hospital care. Moreover, these approaches and treatments are now being integrated into the medical school curriculum, and scientific studies are now being directed toward studying their efficacy since many aspects of alternative medicine have strong physiologic and even pharmacodynamic effects.³

Many forms of alternative therapies exist, such as acupuncture, chiropractic manipulation, and massage. Massage therapy, especially, has grown in popularity. In a 2002 survey commissioned by American Massage Therapy Association (AMTA), more than twice as many Americans said they used massage therapy (18%) in the previous 12 months compared to a similar period in 1997 (8%). The AMTA attributed the increase to a larger elderly population and to in-

¹Department of Anesthesiology, Louisiana State University Health Sciences Center, New Orleans, LA.

²Lindsay's Day Salon & Day Spa, Lubbock, TX.

³Department of Anesthesiology, University of Miami, Miami, FL.

⁴Medical student at Tulane University School of Medicine, New Orleans, LA.

⁵Department of Dermatology, University of Arkansas Health Sciences Center, Lubbock, TX.

⁶Department of Neurosurgery, Mayo Clinic, Rochester, MN.

creased awareness of both the effects of stress as well as the benefits of massage. Moreover, medical practitioners (74%) ranked massage therapy the highest among alternative and complementary practices that are perceived as always or usually effective.⁴ Although awareness about the beneficial effects of massage is escalating, they have not been well documented. Preliminary clinical trial results, however, make it urgent that research on massage therapy become a high priority.⁵

Massage therapy, especially deep tissue massage (DTM), has been used for centuries to relieve myofascial syndromes including muscle spasm, muscle strain, and pain associated with numerous neuromuscular pathological processes. Additionally, voluntary muscle accounts for nearly 50% of body weight, and any single one of the body's muscles may develop myofascial trigger points (TrPs), resulting in either local pain, referred pain, motor dysfunction, or a combination.⁶ These two facts have made muscle strain/myofascial TrPs clinically important to a variety of practitioners including acupuncturists,⁷ anesthesiologists,⁸ chronic pain managers,⁹ dentists,¹⁰ family practitioners¹¹ nurses,¹² and physical therapists.¹³

Recently, studies have demonstrated potential benefits of massage therapy on pathological conditions. These benefits may include alleviating insomnia even in critically ill patients,¹⁴ complementary treatment in multiple sclerosis therapy,¹⁵ reducing anxiety,¹⁶ and easing pain associated with cancer.¹⁷ This is the first focused study to assess the specific change in blood pressure associated specifically with the DTM technique. With 1 in 3 Americans now suffering from hypertension, it becomes even more crucial to explore this facet of complementary medicine.¹⁸ In the present study, we describe the effects of DTM on systolic, diastolic, and mean arterial blood pressure.

MATERIALS AND METHODS

Institutional Review Board approval was obtained through Louisiana State University Health Sciences Center in New Orleans, LA. The study was performed at Lindsey's Salon & Day Spa in Lubbock, Texas between November 2004 and March 2006. The study involved 263 volunteers (12% males and 88% females), with an average age of 48.5. Overall muscle spasm/muscle strain was described as either moderate or severe. Two (2) of the patients involved with the study were having a massage for the first time and were excluded from the study. Patients on antihypertensive medication were included in the study. The level of experience of the massage therapist was 22 years. Baseline blood pressure and heart rate were measured via an automatic blood pressure cuff. Twenty-one (21) different soothing CDs played in the background, barely audible, as the deep tissue massage was performed over the course of the study. The massages were between 45 and 60 minutes in duration. All patients had significant pain prior to DTM. Blood pressure

and heart rate for each volunteer were measured prior to the initiation of massage using a self-storing HEM-704C blood pressure monitor (Omron Healthcare, Inc., Vernon Hills, IL) and again after DTM and compared with baseline. The data were analyzed using analysis of variance with *post-hoc* Scheffe's *F*-test (Excel 2002, Microsoft, Redmond, WA).

RESULTS

Influence of DTM on average, systolic, diastolic, and mean arterial pressure

Results of the present study (Fig. 1) demonstrated an average systolic pressure reduction of 10.4 mm Hg ($p < 0.06$), a diastolic pressure reduction of 5.3 mm Hg ($p < 0.04$), and a mean arterial pressure reduction of 7.0 mm Hg ($p < 0.47$), respectively.

Influence of DTM on heart rate

Results of the present study (Fig. 1) demonstrated an average heart rate reduction of 10.8 beats per minute ($p < 0.0003$).

DISCUSSION

Individual and health professionals' perception of massage, specifically DTM, has changed radically with the advent of well-trained massage therapists who undergo licensure and certification. As scientific exploration gradually validates its benefits, the demand for and the prevalence of massage therapy can only increase. This change in awareness of massage therapy compels health providers in all fields to become familiar with its beneficial physiologic effects.

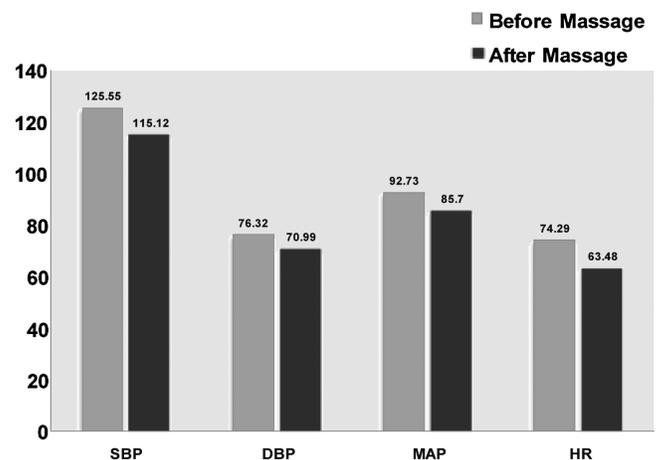


FIG. 1. The effect of massage on systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and pulse.

Our results demonstrate that DTM can significantly affect heart rate, mean arterial blood pressure, and both systolic and diastolic blood pressure in predominately normotensive participants. Although these results shed light on the effects of massage, they also give rise to many questions since the precise mechanism or mechanisms are not well understood. In this regard, long-term beneficial effects are not known, and there is no consensus as to which physical states might benefit from this therapeutic technique.

Recently, massage has been shown to increase tidal volume after lung or heart transplant by 30%.¹⁹ In addition, percutaneous oxygen saturation significantly increased from 92% to 93.6%, central venous pressure decreased by 11%, and pulmonary resistance was reduced from 10.5 to 9.2 H₂O/L/second.¹⁹ These resultant effects may, in part, contribute to the blood pressure measurements revealed by our study. An increase in O₂ saturation may diminish activation of the renin-angiotensin pathway, thereby lowering serum sodium concentrations by decreasing aldosterone production and reducing vasopressor responses via angiotensin II production.

Massage has also been shown to decrease postsurgery edema in patients.²⁰ Edema is usually caused by a mismatch in hydrostatic or oncotic pressure, which implies that massage may positively modify some of the vascular and lymphoreticular irregularities in patients. These effects, in turn, may further explain the favorable changes in blood pressure and heart rate measurements observed in the present study.

The effects of massage on blood pressure may have a cellular pathway. It was recently demonstrated that massage, by stretching tissue, may change fibroblast length and size. The associated cellular adjustments stimulated by this change include modification of signal transduction, mRNA and ribosome location, transcriptional events, cell adhesion dynamics, and production of extracellular matrix.²¹ Future investigations may link these changes with the cardiovascular response noted in our research sample.

Pain and stress modulation may also be a contributing factor to our results. Underlying pathophysiological processes can result in short-term production and permanent elevations of many mediators that can induce transient increases in blood pressure.²² Ultimately, the antistress effects of massage may one day become integrated with pharmacologic management of essential hypertension in the future as more evidence is uncovered concerning the link between hypertension and DTM.

Although massage therapy has been generally regarded as safe, some forms, such as DTM, may involve substantial physical force. For this reason, some conditions serve as contraindications for massage therapy, such as deep venous thrombosis, damage to skin from rashes, infections, wounds, bone fractures, and advanced osteoporosis. Serious adverse effects, such as bone fractures and liver rupture, have been reported as rare.²³ Consequently, the efficacy and safety of DTM in hypertensive patients might be considered as a complementary therapy to antihypertensive medications, and future studies are warranted to ascertain benefit in different

subpopulations and better understanding of the mechanisms seen from the present study.

Only a few investigations have been published in recent years that quantify the effects of massage on blood pressure; the most recent of which involved 150 subjects receiving a variety of massage techniques. The results demonstrated only minimal changes in blood pressure, with an overall decrease in systolic blood pressure of 1.8 mm Hg and an overall increase in diastolic blood pressure of 0.1 mm Hg.²⁴ The present investigation builds on these findings with a larger sample size and is more focused, involving only DTM.

A recent study observed the effects of consecutive Swedish massage techniques on 16 healthy males over a 12-week period and demonstrated a mild to moderate overall decrease in blood pressure.²⁵ This suggests the potential for other massage techniques providing beneficial cardiovascular effects, not limited only to DTM.

Although all of the patients in the present study reported pain prior to deep tissue massage, a pain score was not performed just prior and immediately after. Additionally, the varied musical CDs in the background were not correlated with individual reductions in blood pressure or heart rate; however, it is unlikely that any individual melody altered hemodynamics, as the music was barely audible in the background sound system utilized at the spa.

The general public, with numerous disease states, are having increasing numbers of massages and these therapeutic benefits are becoming more appreciated. Growth and acceptance of this form of complementary and alternative therapy are evidenced by increasing insurance coverage, approval by physicians, the number of visits made to alternative medicine practitioners, and the increasing amount of research concerning its benefits. Although many studies have been performed to understand the utility behind massage therapy, the scientific quality of these efforts has been inconsistent and inadequate. This leaves many questions to be answered. Currently, the long-term efficacy of massage therapy has not been elucidated, nor has its cost-effectiveness. Unfortunately, pre- and post-testing design has been lacking. Appropriate sample sizes and analytical methods must be enforced before results can have significant impact in the medical community. Moreover, larger double-blind studies are needed before anyone can confidently advise that it be part of a hypertensive treatment protocol, along with standardization of treatment. Finally, future studies may also be directed toward long-term safety in hypertensive patients, as well as head-to-head cost-effectiveness of this treatment compared to common medical intervention.

CONCLUSIONS

In summary, the present study demonstrates a high correlation between DTM and reduction in blood pressure and heart rate. These data are encouraging and positive, repre-

senting optimism and a hopeful outlook for future research in this area.

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Address reprint requests to:

Alan David Kaye, M.D., Ph.D., D.A.B.P.M.,
Department of Anesthesiology

Louisiana State University Health Sciences Center
Stanislaus Hall
450A South Claiborne Avenue, Room 231
New Orleans LA 70112

E-mail: akaye@lsuhsc.edu

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