

## Recent advances in massage therapy – a review

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**Abstract.** – Massage therapy is one of the most widely accepted alternative form of medicine helping patients suffering from varied pathological states including arthritis, anxiety, sleep problems, pain management and injury repair. Besides this, it is one of the safest forms of alternative medicine and has become favorite among various health care professionals. However, there is still a lot of debate is going in medical world pertaining to its certain use in modern medicine. So, the present review shall enlighten all the latest aspects of massage therapy in current medicine.

*Key Words:*

Massage therapy, Joint pain, Arthritis, Periarthritis.

### Introduction

People take several types of medication depending upon their illness. These medications may vary from easy painkillers to antidepressants and anti-cancer drugs. In the last ten years, there has been an expansion in the usage of complementary and alternative medicine therapies and one of the most popular and preferred complementary and alternative medicine therapies is massage therapy admired by a vast number of people<sup>1</sup>. Massage therapy is becoming a number one choice for stress reactions, anxiety issues, sleep problems, pain management, injury repair for trauma, enhancing recovery time for athletes in training and more importantly to enhance one's feeling of well being.

Massage may regularly be professed as a safe & beneficial means devoid of any major risks or side effects if rendered by a trained professional<sup>2</sup>. However, despite its increasing popularity, there continues to be ongoing debate on the effectiveness of massage in complementing the modern medicine. Some people even suggest that massage can replace modern medicine. As it is non-invasive and inexpensive compared to other treatments wherein the patients have to pay hefty fees, there is an opportunity for the scientific community to revisit this field with intense vigor.

### *Physiology of Massage Therapy*

The history of massage encompasses a vast number of cultures around the world wherein variety of massage techniques have been used for several thousand years. Massage therapy comprises of range of techniques like stroking, vibration, holding, pressing and each technique represents a unique approach to treatment of the musculoskeletal and other systems. Even though research has been going on for some time now, the one thing that bonds together all the technique is the concept of touch. The basic principle behind massage therapy is to produce certain physiological effects on the musculoskeletal, nervous and vascular system of the body by careful manipulation of soft tissues<sup>3,4</sup>. Experiments conducted world over have shown evidences that massage affects the functionality of both animal and organic life. Mechanical pressure created by massage encourages the increase in circulation of blood by increasing the arteriolar pressure<sup>5</sup>. Blood is the most important connective tissue in the human body entrusted with carrying oxygen and all of the nutrients that we have absorbed from food, (carbohydrates, proteins and fats), and taking away various metabolic wastes from various parts of the body. Sefton et al<sup>6</sup> conducted a study to determine the effect of therapeutic massage on peripheral blood flow utilizing dynamic infrared thermography wherein it was concluded that therapeutic massage of the neck and shoulders produces changes in peripheral blood flow. Thus, a massage offered to a body simply promotes circulation and paves the way for further amounts of oxygen, proteins and several other substances essential for cellular metabolism, thereby, assisting in swift repair and amelioration of pain.

Proper lymph dynamics are essential for effective immune system. Lymphatic system plays a necessary role in fighting infection and in retrieving lactic acid, cell debris and intestinal toxins from the tissues, and the same is said to be positively affected by massage therapy<sup>7-9</sup>. It is report-

ed that application of lymphatic drainage massage especially to persons who have sports injuries can fuel the opening of the initial lymphatic and increase the volume of lymph flow. There have been several animal studies<sup>10-12</sup> which suggested possible usefulness of manual lymphatic drainage (MLD), a specialized, gentle type of skin massage in animal models. In a randomized trial conducted by Ekici et al<sup>13</sup>, application of MLD to women with fibromyalgia resulted in improvements regarding pain, health status, and health-related quality of life. Lancaster and Crow<sup>14</sup> revealed that osteopathic manipulative treatment subjected to a 26-year-old woman with Bell's palsy resolved her symptoms within 2 weeks. MLD has also been reported to facilitate rapid decrease in the levels of serum muscle enzymes like lactate dehydrogenase (LDH) and in aspartate aminotransferase (AST) which are otherwise elevated after a strong bout of exercise<sup>15</sup>. Recently, it was reported<sup>16</sup> that conjugation of MLD and the therapeutic ultrasound evidently abridged the swelling and the tissue fibrosis, and helped in vanishing of pain in liposuction and lipoabdominoplasty post operative period.

Massage therapy reportedly helps in healing of the sore muscles. It is evident that vigorous exercise is responsible for producing small tears in muscle fibers, thereby, leading to inflammation and pain. The inflammatory phase involves the activation of immune cell and its penetration, and release of cytokines by muscle and adjacent immune cells<sup>17</sup>. Investigations have revealed that massage causes reduction of cytokines which are accountable for inflammation and pain. Above all Nuclear factor  $\kappa$ B (NF- $\kappa$ B) has been designated as a master of pro-inflammatory signaling pathway, as it regulates the expression of other pro-inflammatory products like cytokines, chemokines, and adhesion molecules, which have been largely mentioned and reviewed in majority of the research articles<sup>18</sup>. NF- $\kappa$ B levels rise with high amounts of inflammation and also works in response with other cytokines. Consequently, decreasing its abundance would be advantageous in keeping inflammation from getting out of hand. In one such recent study, Crane et al<sup>19</sup> found that massage therapy lowered the production of the NF- $\kappa$ B, inflammatory cytokines and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), thereby, allaying the cellular stress ensuing from exercise-induced muscle injury. Also, massage is reported to promote mitochondrial biogenesis wherein new mitochondria are formed in the cell. PGC-

1 $\alpha$  is a main regulator of mitochondrial biogenesis<sup>20</sup> and low expression of PGC-1 $\alpha$  has been coupled to greater inflammatory cytokine expression<sup>21</sup>. Crane et al<sup>19</sup> also found increased levels of PGC-1 $\alpha$  in massaged leg which preceded the reduction in NF K $\beta$ , although many would argue that this might be due to result of stimulation resulting from exercise only.

### **Massage Therapy and Cancer**

Cancer is a deadly disease characterized by uncontrollable cell growth. Although there is no scientific evidence that indicates that massage therapy helps cure cancer, cancer patients mostly take to massage therapy which helps in coping and, improves quality of their life. In 2005, Reif et al<sup>22</sup> conducted a study on randomized group of women suffering from breast cancer. The women received massage therapy and it was reported that the levels of Natural Killer cells, and lymphocytes increased from the first to the last day of the study. A review was conducted by Ernst<sup>23</sup> who included randomized controlled trials testing the efficacy of massage on palliative and supportive care for cancer patients. It was suggested that massage could lessen a wide array of symptoms but the evidence was not compelling enough though. Billhult et al<sup>24</sup> revealed that massage treatment to women with breast cancer undergoing chemotherapy significantly reduced nausea. Sood et al<sup>25</sup> reviewed accessible literature on the use of complementary and alternative medicine treatments for cancer-related fatigue and recommended that large-scale randomized trials massage be performed to extract maximum information as the interventions showed promise.

Falkensteiner et al<sup>26</sup> conducted systematic literature analyses regarding effectiveness of massage therapy for pain, anxiety and depression in patients receiving palliative oncology care and concluded that massage therapy certainly contributed to the decrease of pain, anxiety and depression. A pilot study<sup>27</sup> conducted in 2012 on patients with brain tumours revealed significant reduction in distress level while receiving massage therapy. In a randomized controlled clinical trial study conducted by Mazlum et al<sup>28</sup>, it was observed that massage therapy decreased chemotherapy-induced nausea and vomiting in pediatric cancer.

### **Mechanics of Massage therapy**

Various physiological factors are affected/stimulated via massage therapy. The competence of massage therapists depends on the fact that how

well they utilize the body mechanics in the delivery of massage therapy as it is critical for the value of the therapeutic care. It is apparent that it all starts from the mechanical stress induced by various therapy techniques. When certain kind of (mechanical) stress is introduced to living cells, a complex array of sensors, transducers lying at the surface of the cells are capable enough to respond and correspondingly adapt to the stress. As mentioned in the above line, these are complex networks leading to several mechanisms and we have tried to generalize the principle of mechano-transduction. Generally speaking, if a cell detects a mechanical stimulus in the form of massage, it needs three components to respond viz. mechanoreceptors, signal transducers and target activators. Like evidenced by several reports, mechanical stimulus such could lead to cellular signaling only if physical disturbances in the cell membrane and the extracellular matrix are conveyed through intermediary trigger proteins<sup>29</sup>. Integrins are those intermediate transmembrane proteins that connect the extracellular matrix to the cytoskeleton through focal adhesion proteins in the cytoplasm<sup>30</sup>. Several text books have articles regarding the structure of integrin family protein and mentioning their reactivity towards mechanical stimulus. Integrins have been described as multi (hetero) dimeric proteins displaying an extracellular binding domain, a transmembrane domain, and a cytosolic domain. 22 different types of integrins have been identified in mammals, wherein each of which specifically recognizes binding domains on collagen, laminin, fibronectin, and/or other matrix proteins<sup>31</sup>. A mechanical stimulus applied to integrins is responsible for activation of several kinases such as focal adhesion kinase (FAK) and the mitogen-activated protein kinase (MAPK) family of proteins. These sets of kinases play further role in eliciting a surge that triggers regulatory factors that modulate protein synthesis, glucose uptake, and immune cell recruitment<sup>32,33</sup>. Thus, massage presents a body with a systematic mechanical stimulus followed by varying degree of signaling cascade to induce a positive effect.

### ***Massage Therapy and Psychology***

The human body is a complex system. Body and mind should work together to achieve peak performance. Mind understands and picks up signals that your body sends in and accordingly strategies are in place to deal with a particular situation. In today's world virtually everybody is under constant stress due to which many people

are facing anxiety, depression and other psychological disturbances. Here comes the role of a psychologist who may analyze the patients and would help him/her to deal with the condition. However, there are evidences that massage therapy has been beneficial to people in the treatment of anxiety and other psychological disturbances. Anxiety attacks are indicated by high blood pressure, increased heart and respiratory rate. Arterial vessels have pressure sensing protein receptors also called baroreceptors which cater to resolve the matters related to constriction and dilation of blood vessels. In anxiety ridden persons, the sensitivity of these receptors is compromised with low threshold levels implying that a small amount of irritation or concern can trigger rise in blood pressure and heart rate, which in turn can prompt the full manifestation of an anxiety attack. By subjecting the patients to massage therapy, it is possible to reset the threshold levels of the receptors so as to reduce the anxiety attacks.

Massage therapy to a randomly assigned trial group consisting of depressed pregnant women reported lower levels of anxiety and depressed mood<sup>34</sup>. A pilot study<sup>35</sup> conducted on a young adult psychiatric inpatient unit revealed that massage therapy improved upon on anxiety-related measures. Toro-Velasco et al<sup>36</sup> found that a single session of massage to patients with chronic tension-type headache was able to reduce tension, anger status, and perceived pain. Noto et al<sup>37</sup>, in a study conducted on young healthy female volunteers suggested that back massage therapy encouraged psychological relaxation. In yet another investigation conducted by Noto et al<sup>38</sup> on cancer patients, it was reported that leg massage might encourage psychosocial relaxation and strengthen immune system with an increased secretion of antimicrobial peptides. Lopez et al<sup>39</sup> mentioned that physiotherapy with articular manual therapy, combined with cervical muscle stretching and massage are effective for tension-type headache.

### ***Massage Therapy and Joint Pain***

We all know that joints are simply the articulations between two segments of bones, and mobility of the human body requires that joints act as fulcrum wherein muscles pull in one segment of the bone. There are three types of joints depending upon the kind of material present viz; fibrous, cartilaginous and the most common type the synovial joint. Synovial joints are the movable joints of the body occurring in great numbers and show an array of form and range of movements<sup>40</sup>. Any

form of disease or injury like osteoarthritis, rheumatoid arthritis, bursitis, gout, and other injuries can harm the joints and hinder with the movements and may lead to lots of pain. Massage therapy has been employed by several joint pain sufferers, and signify an effective option to cope with pain and improve their range of motion so they have more mobility<sup>41,42</sup>. Initial findings of a pilot randomized clinical trial<sup>43</sup> depicted that manual therapy could be beneficial for reducing headache and neck pain intensity and increasing motor performance of the deep cervical flexors, cervical range of motion in individuals with cervicogenic headache. Field et al<sup>44</sup> reported that moderate pressure massage therapy to patients with rheumatoid arthritis in the upper limbs displayed lesser pain, greater grip strength and greater range of motion in their wrist, elbow and shoulder joints. Recently, Field et al reported that applying a topical analgesic following massage therapy might be more effective in treating pain associated with hand arthritis. A randomized controlled trial conducted by Perlman et al<sup>46</sup> on participants having osteoarthritis of knee helped establish an optimum dose wherein treatment groups reported decreased pain perception which could be used as standard for future trials. In another study conducted at the Lourdes Wellness Center in Collingswood<sup>47</sup>, it was demonstrated that patients with osteoarthritis of knee profited from the massage intervention therapy. In one such case study<sup>48</sup> massage therapy brought about a marked improvement in range of motion and gait characteristics such as gait speed, length, and swing and stance phase percentages in a person with incomplete spinal cord injury. Sanchez et al<sup>49</sup> while investigating on patients with fibromyalgia deduced that massage therapy decreases the sensitivity to pain at tender points in patients thus improving their pain perception.

### **Massage Therapy and Spine**

Diego et al<sup>50</sup> observed that massage therapy to spinal cord injury patients went on to lower the anxiety and depression scores and also considerably increased the muscle strength and wrist range of motion. A study<sup>51</sup> conducted on a 30-year-old female diagnosed with spondylolisthesis revealed that onset of low back pain was belated during walking or standing over the course of therapy. In one such case study<sup>52</sup> done on a 47-year-old female who underwent spinal decompression and fusion surgery of lumbar spine, it was observed that massage therapy tend to have beneficial ef-

fects. In a study conducted by Avery<sup>53</sup> on a 66-year-old female client with cervical degenerative disc disease, it was observed that cervical range of motion had improved reasonably with subsequent reduction in pain with enhanced daily activities. Baker et al<sup>54</sup> suggested that massage treatment to women with chronic neck pain brought about relaxation and reduction of pain.

### **Massage and Periarthritis of Shoulder**

Periarthritis of shoulder joint is one the most common injury of periarticular soft tissues. Also known as frozen shoulder, it is a painful state arising due to inflammation of the connective tissue covering the glenohumeral joint of shoulder thereby very much affecting the range of motion. Jurgel et al<sup>55</sup> suggested that a rehabilitation program combining exercise with electrical therapy and massage brought an improvement in shoulder flexion, extension, abduction and adduction active range of motion in patients with frozen shoulder. Sokk et al<sup>56</sup> reported that massage combined with electrical therapy brought about a decrease in shoulder pain and enhanced maximal voluntary contraction force of the shoulder flexors in patients with frozen shoulder. A systematic review of several articles was conducted by Camaronos et al<sup>57</sup> in order to identify the effectiveness of manual therapy to the glenohumeral joint, and an inclination was established supporting manual therapy for decreasing pain. In a clinical trial Yang et al revealed that massage improves glenohumeral internal rotation range of motion significantly in subjects with posterior shoulder tightness<sup>58</sup>. Recently, Chen et al<sup>59</sup> undertook comparison of clinical efficacy different stimulation therapies for periarthritis of shoulder. It was observed that activities of shoulder joint were improved and the acupoint massage had clear clinical effectiveness as compared to other stimulations.

### **Conclusions**

It is clear from the above studies that massage may provide relief in multiple ways. However, the key to beneficial effects of massage therapy lies in the method or technique employed by therapists. A person might have different goals for massage like relieving himself/herself from stress, anxiety or pain due to arthritis or limited range of movement in a particular portion of body. So, it is important to mention to the thera-

pist about your problems which would enable him/her to alter the technique required. That is why massage therapy is a specialized field and is expanding its horizons day by day. Numerous trials have been designated for massage therapy in the future and we may see gathering of more knowledge regarding massage therapy.

### Conflict of Interest

The Authors declare that they have no conflict of interests.

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Massage therapy can help. "Massage increases and improves circulation. Just like rubbing your elbow when you knock it on a table helps to relieve the pain," says Tanason. A 2011 study published in the *Annals of Internal Medicine*, found benefits of massage therapy as effective as other methods of treatment for chronic back pain. #3: It soothes anxiety and depression. "Human touch, in a context that is safe, friendly and professional, can be incredibly therapeutic and relaxing," says Tanason. Women diagnosed with breast cancer who received massage therapy three times a week reported being less depressed. Advances in Therapy is an international, peer reviewed, rapid-publication (peer review in 2 weeks, published 3-4 weeks from acceptance) journal dedicated to the publication of high-quality clinical (all phases), observational, real-world, and health outcomes research around the discovery, development, and use of therapeutics and interventions (including devices) across all therapeutic areas. Advances in Therapy will consider all scientifically sound research be it positive, confirmatory or negative data. The editorial team check all manuscripts to ensure that articles conform to the most recent COPE, GPP and ICMJE publishing guidelines. This supports the publication of ethically sound and transparent research.