

## C14 M 7.3 Effects of Massage

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Objectives	After going through this module the reader will be able to <ol style="list-style-type: none"><li>1. list the physiological effects of massage</li><li>2. understand the mechanism of effects</li><li>3. learn to use the particular effect for therapeutic and restorative purposes</li></ol>
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## **Summary**

Study of the effect of massage is the study of physiology. Without complete knowledge of physiology the effects of massage cannot be understood in proper context. Massage applies mechanical energy to the soft tissues of the body and effects of this energy transmission are minute, interrelated and spread over several systems. Massage improves the mobility of soft tissues and prevents adhesion formation. The improved venous and lymphatic flow following massage reduces the congestion of the area and helps accelerate disposal of waste production. These effects along with the effect of increase in arterial flow enhance the nutritive state of the part. The second major effect of massage is stimulation of sensory receptors which imparts an array of sensory experiences and leads to pain relief, modulation of muscle tone and also promotes relaxation. Many effects of massage are not conclusively proved for the want of appropriate scientific studies.

## **Introduction**

Massage manoeuvres impart mechanical energy to the body. The rhythmic application of touch and pressure produces several effects on human body. These physical, physiological, and psychological effects are produced by mechanical and reflex mechanisms. The effects of massage on the body is very much technique dependent. The amount of mechanical energy imparted to the body depends on magnitude, duration, and direction of force generated by a particular technique. Therefore the effects produced by different techniques vary. In general the effects of massage fall in two broad categories- mechanical effects and neural effects which are also known as reflex effects. The interaction of these two effects brings about several other interrelated effects. The study of the effects of massage is in fact the study of physiology of the body. It is assumed that readers are well versed with the physiology of the circulatory and the neuromuscular system. In this module the effects of massage on the body as a whole is described.

### **1. Mechanical effects of massage**

During massage manoeuvre, touch and pressure is applied to the body in rhythmic manner that produces the following three main effects:

1. Stimulation of the sensory receptors
2. Compression and relaxation of blood vessels and
3. Movement of the soft tissue of the body

Each of these effects produces a series of interrelated effects on circulatory, nervous and metabolic systems. In addition massage also produces strong psychological effects that may influence the immune system.

#### **1.1. Effects on Soft Tissue**

Massage exerts significant influence on elasticity, plasticity and mobility of the soft tissue. In order to understand the effect of massage on soft tissue some understanding of anatomy and composition of soft tissues is required. Muscles, ligaments, skin, fascia, capsules etc. are the soft tissues of the body. Soft tissues are composed of loosely bound minute collagen fibres that are suspended over an amorphous ground substance called matrix. Soft tissues can be classified as contractile tissue and non contractile tissue. Muscle is a contractile tissue as it has the capacity to contract (shorten) upon receiving an electric impulse. This produces a change in the length of muscle. Skin, ligaments, tendons, fascia are the non-contractile tissue which do not have the inherent ability to contract but they are capable of movement. In fact during voluntary contraction of a muscle movement of soft tissue takes place. Minute movements of the constituent collagen fibres also occur whenever a force is applied to soft tissue. This small

movement of soft tissue is essential for the smooth execution of voluntary movement.

Injury and disuse have a negative effect on the mobility of soft tissue. Inflammation in the early phase of healing is characterized by the presence of exudates in the extra vascular space. Exudate is a protein rich fluid leaked through newly formed capillaries. Accumulation of exudates in the extra vascular space gives rise to swelling that persists long after the inflammatory response is over. Over a period of time this fluid-like material consolidates and binds the fibres of the soft tissue to each other and to the surrounding structures. This binding of the soft tissue fibres to each other is known as adhesion which gives rise to reduced mobility of soft tissue and is reflected in the form of tightness and pain during movement of the part. This is the usual cause of pain and inefficient functioning of the muscle and the joints after injury. The same phenomena occur during disuse. When a part is not moved for a long time the constituent collagen fibres of the soft tissue gets stuck to each other.

Massage techniques apply a passive force on the soft tissue of the body and move them in various directions. The to and fro movement of different massage manoeuvres rolls the individual fibres of the soft tissue, mechanically breaks down the adhesion and facilitates free movement of the adherent structures. This makes massage a powerful therapeutic tool in all the conditions where restriction of soft tissue mobility due to injury, disease or disuse becomes the cause of pain and dysfunction.

Massage facilitates the movement of the skin over underlying structures. As a result skin becomes soft, pliable and supple. The dead cells of skin are removed by movement of hand over skin. This makes the sweat glands and the sebaceous glands free from obstruction and allows them to function more effectively. The improved functioning of sweat and sebaceous glands improves the lubrication and appearance of the skin.

Massage with various oils is a common practice. It is believed that massage by various medicinal oils has some curative values in certain diseases and prescription of massage with medicinal oils is a common practice in Indian medicinal systems. Oil massage enhances penetration of medicinal molecules into the skin.

## **1.2. Effect on Circulatory System**

It is a common observation that rubbing vigorously makes a body part warm and red. This warmth and redness is due to improved blood flow to the rubbed area. As a result of rubbing the capillaries and arterioles get dilated and filled with blood which is responsible for raising the temperature of the area and making it red. These observations led to the widespread belief of the practitioners of massage as well as of a layman that massage improves the blood supply of the area.

The circulatory system consists of three main channels of blood flow - arterial system, venous system and lymphatic system. The vessels of venous and lymphatic system have valves whereas the arterial system does not have any valve. The function of the valves is to prevent the backward flow of blood. The arterial system brings fresh blood from the heart to the peripheral parts of the body. The venous system takes the impure blood from periphery to the heart. The lymphatic system is an accessory route by which larger molecules like proteins debris and other matters of tissue space which do not get entry into the venous system return back to the circulatory system. The effects of massage are more pronounced on venous and lymphatic flow.

Massage facilitates emptying of venous and lymphatic vessels and improves the venous and lymphatic drainage. The massage manoeuvres alternately compress and release the soft tissue. This mechanical compression resembles that of normal muscle contraction that increases the pressure of a venous and lymphatic segment and facilitates opening up of the valve so that blood and lymph move into the next segment. This way massage facilitates the forward movement of venous blood and lymph and aids in mechanical emptying of veins and lymphatic vessels. This reduces the stagnation of fluid in the soft tissue and speeds up the removal of waste products. This effect of massage is used in the treatment of swelling following dysfunction of venous and lymphatic vessels. During inactivity and paralysis the muscle pumping action on vessels is lost and gives rise to swelling. Massage in these situations serves as an important substitute of muscle activity with regards to venous and lymphatic drainage.

Massage also improves arterial flow. Vasodilatation along with increase in peripheral blood flow is usually observed following massage. The increase in the arterial flow following massage is attributed to the release of vasodilator, reflex action and also to the result of reduction in venous congestion. Increased arterial blood flow brings more oxygen and nutritive elements to the massaged area. These effects are believed to accelerate the various metabolic processes of the body and facilitate the exchange of waste products of metabolism leading to improved nourishment to the area. The accelerated blood flow to the area is the reason of using massage after an exhaustive bout. It is believed that massage promotes rapid disposal of lactic acid accumulated after intense physical exercises. However research evidences do not support this view. Investigation have shown that the rate of lactate removal following post activity massage was no different from that obtained after simple passive recovery.

### **1.3. Effect on Respiratory System**

Another mechanical effect of massage is its influence on the functioning of the respiratory system. Techniques of percussion and vibration help in dislodging thick viscid secretions from the lung and assist in the removal of respiratory secretion. After the removal of secretion gas exchange becomes more efficient and oxygen content of blood increases. However, it should be noted that effects

of massage on the respiratory system are produced by the specialized techniques that should be administered by a well trained practitioner only.

## **2. Neurophysiological effects of Massage**

Massage stimulates sensory receptors present in the skin. The different manoeuvres of massage impart an array of sensory experiences by stimulating peripheral touch and pressure receptors present in the skin and soft tissues. The stimulation of a sensory receptor generates an electric impulse that travels through the nerve fibres to spinal cord and brain and exerts significant influence on the sensory, motor and autonomic components of the central nervous system.

### **2.1. Effects on Sensory System**

On sensory system the main effects of massage are sedation and perception of well being. Use of massage for pain relief is an age old practice. However the exact mechanism by which massage reduces pain was entirely speculative until Melzack and Wall put forward their famous pain gate theory in 1965. This theory provides a rationalized scientific explanation for the pain relief obtained by massage and other procedures that use sensation as a means of pain relief. This theory held that like touch, pressure, heat and cold, pain is also a sensory stimulus that travels through sensory nerves to the brain via the spinal cord. Unless an impulse reaches the corresponding area of the brain the sensation is not felt. Therefore for the feeling of the sensation of touch, pain, or pressure the electric impulses of these sensations must reach the brain. The speed of transmission of these different sensory stimuli varies. While the stimuli of touch and pressure travel at a faster pace, the stimulus of pain travels at a relatively slower speed. Therefore when applied together the impulses that travel at a faster pace reach the spinal cord early and block the path of other impulses that reaches there afterwards. So application of other sensory stimulus in presence of pain blocks the upward travel of pain impulse and provides pain relief. The second aspect of this theory relates to the response of the brain to the pain stimulus. When a painful stimulus reaches the brain, some parts of the brain releases certain chemicals having anti-pain properties. These are called endogenous opiates. These chemicals have a role in producing pain relief and giving a perception of well-being.

The pain gate theory explained the pain relieving and well-being effects associated with massage techniques. Massage manoeuvres stimulate deep and superficial interceptors, proprioceptors in tendons and muscles and interoceptors present in deep tissues and organs. These sensory impulses are carried to the spinal cord by beta fibers of large diameter. The light massage techniques such as effleurage, stroking, kneading etc. apply sensation of touch and pressure that competes with pain sensation and blocks their upwards transmission leading to pain relief. On the other hand those manoeuvres of massage that produce mild to moderate discomfort, for example friction and deep kneading, stimulate

secretion of endogenous opiates that helps improve the circulation and promote feeling of well-being besides reducing pain.

## **2.2. Effects on Motor System**

Effects of massage of motor system confines to regulation of muscle tone which is a reflex phenomenon affected by changes in the central and the peripheral nervous system. The state of preparedness of a muscle for contraction is called muscle tone. A low muscle tone is indicative of poor contractile ability where a relatively higher degree of stimulation is required to produce contraction in the muscle whereas a high muscle tone indicates that a muscle requires much less stimulation for contraction. Muscle tone can be modulated by peripheral sensations. The effect of massage on muscle tone is the reflex effect that results from stimulation of sensory receptors and may be mediated through spinal motoneuronal excitability. Spinal motor neuron is the spinal centre that sends facilitatory or inhibitory signals to the muscle. The spinal centre itself receives facilitatory or inhibitory signals from higher centres of the brain as well as from the periphery. The sensory signals generated by the stimulation of sensory receptors may influence the excitability of spinal motor neurons and affect the muscle tone.

Massage exerts both facilitatory and inhibitory effects on the motor fibres. Some massage techniques are known to increase the muscle tone whereas the others reduce the motor tone. These seemingly paradoxical effects are believed to be the result of stimulation of different receptors due to the variation in the rate of application and pressure applied during various massage manoeuvres. Some massage techniques increase the muscle tone by stretching the muscle spindle or stimulating the superficial exteroceptors. Superficial techniques of massage such as taping, hacking, superficial stroking are believed to increase the muscle tone. Pressure on the muscle belly stretches the muscle fibres and stimulates the muscle spindle which excites the motor neuron pool. On the other hand deep massage techniques such as pertissage and kneading are believed to reduce the tone of muscle by application of heavy pressure. It is postulated that the application of deep pressure during these techniques activates the tension dependent golgi tendon organ that has an inhibitory effect on the stretch reflex mechanism.

Reduction of muscle tone contributes to relaxation and forms the basis of using massage in conditions associated with increased muscle tone such as muscular spasm, pre-competitive anxiety etc. On the other hand increase in muscle tone may bring about increased preparedness of muscle for contraction that may justify the use of massage prior to sports events.

That massage can enhance the strength of muscle is a common belief. However, most of the authorities on the subjects are of unanimous opinion that massage on its own does not increase the strength of muscle. Muscle strength can only be increased by the making the muscle contract against resistance and the only way

to increase the strength of muscle is active exercise. However, massage may prepare the muscle for efficient contraction by improving its mobility, circulation and removal of metabolic waste products, which may contribute to better performance during active exercises.

Similar myth exists with regards to the use of massage in reducing the obesity. It is claimed that massage improves lipolysis and this forms the basis of using massage in obesity reduction programme, both manually and in the form of vibratory belt. However, the scientific rational and evidence does not support this view. Obesity is a condition of positive energy balance resulting from a combination of increased intake of energy and reduced expenditure resulting from the lack of activity. Massage at best can be used as an adjunct to the weight reduction programme for lessening the fatigue associated with vigorous exercises and preparing the muscle for efficient work. Ultimately it is the intensity of active work-out that helps in burning calories and reducing obesity, not the massage alone.

### **2.3. Effects on Autonomic System**

The effects of massage on the autonomic nervous system is also mediated through reflex action. It is hypothesized that sensory stimulation by massage may evoke a variety of autonomic reflexes that in turn may influence the functioning of visceral organs. This is the basis of using massage techniques in reflexology and massage approaches other than classical massage. Physiological responses associated with autonomic nervous system such as heart rate, respiratory rate, blood pressure, skin temperature, skin resistance, activity of sweat glands etc. are claimed to be affected by massage. Increased activity of vagus nerve resulting in lowering psychosomatic arousal and level of stress hormones are postulated as some of the possible mechanisms for this. The reduced stress level is also shown to be associated with improved functioning of the immune system. But the scientific evidences on these claims are not conclusive. Some studies have reported an increase whereas others have reported no effect of massage on these parameters. Most of the studies on these topics suffer from serious methodological flaws.

### **2.4. Psychological Effects of Massage**

Massage exerts a strong placebo effect. Touching a person communicates an intention to heal, share energy and promote relaxation. The importance of touch in communication and imparting a sense of well-being and confidence is always recognized. Massage is known to reduce anxiety and tension and induce relaxation. This effects is more pronounced when massage is used for the purpose of general relaxation.

Studies have consistently support that massage enhances the perception of well-being and relaxation. The psychological parameters associated with stress and



anxiety have been shown to be reduced after massage. This makes massage a powerful non-pharmacological agent in stress relieving strategies. The ambience of massage, the way of communication of the massage operator and the assured way of handling all induce strong placebo effects that helps to allay anxiety and induce comfort. The effects of massage on psyche are hypothesized to generate a number of favourable autonomic and immunological responses. It is now established that stress reduction contributes favourably in many psychosomatic conditions. It is also claimed that massage improves the functioning of the immune system. Research reports have supported the assumption that regular massaging of a child with oils helps improve the growth and development and enhances ability to fight infection.

Many claims on the effects of massage are difficult to validate in the rigorously designed scientific studies and they also remain unproved . However, massage remains one of the methods which has been found useful by the practitioners and the users.

