

Massage – the scientific basis of an ancient art: part 1. The techniques

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Manual massage is a long established and effective therapy used for the relief of pain, swelling, muscle spasm and restricted movement. Latterly, various mechanical methods have appeared to complement the traditional manual techniques. Both manual and mechanical techniques are described systematically, together with a review of indications for use in sports medicine.

Keywords: Massage, history, techniques, applications

The manipulative techniques traditionally classified as massage consist primarily of palpation, rubbing and kneading. These arose from the natural, intuitive desire to rub a painful injury. Massage is widely used in sports medicine and has much to offer the injured athlete. The therapeutic effects are diverse and include control of swelling, increased blood flow, and relief of pain and muscle spasm. Massage accelerates inflammatory processes and mobilizes contracted fibrous tissue. Massage will also affect muscle tone and cause general relaxation.

History

The first mention of massage appears in the *Nei Ching*, the oldest existing medical work, written before the death of the Chinese Emperor Huang Ti in 2598 BC¹. Ancient Indian and Greek texts, including the work of Hippocrates, describe massage as an effective therapy, especially for treating sports or war injuries, and the practice spread widely within the Roman Empire. The social decadence of the late Roman period tarnished the reputation of massage for more than a thousand years and the merits of this manual therapy remained hidden until the Renaissance².

The era of modern massage began in 1863 with the publication of a treatise systematically classifying each technique according to the bodily system affected³. This stimulated scientific research and, as instrumentation improved, modern massage techniques developed rapidly. These are described fully elsewhere⁴⁻¹¹. Some innovations were technological, such as pneumatic systems producing rhythmical

compression and the introduction in 1939 of ultrasound therapy, now widely used in sports physiotherapy.

The techniques of massage

Tradition defines massage as 'hand motions practised on the surface of the living body with a therapeutic goal'¹². The resurgence of therapeutic massage began in France and much of the nomenclature is in that language. The techniques, both manual and mechanical, are described below together with specific indications for their use. Contraindications to massage are few, but include malignancy, infection of body fluid and unusually fragile skin.

Manual techniques

Effleurage

These slow rhythmic stroking hand movements, moulded to the shape of the skin, frequently begin and end a treatment session (*Figure 1*). The strokes pass from distal to proximal and parallel to the long axis of the tissue. Gradual compression reduces muscle tone and induces a general state of relaxation that relieves muscle spasm and prepares the patient for more vigorous treatment. Firm pressure accelerates blood and lymph flow, improves tissue drainage and thus reduces recent swelling. Rapid strokes have the opposite effect. These will increase muscle tone and may be useful during the final preparation for competition.



Figure 1. Effleurage

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Kneading

Kneading consists of slow circular compression of soft tissues against underlying bone. The greatest pressure is applied as the hands move proximally, although contact is continuous. Small areas are usually treated using the fingertips alone. Kneading promotes the flow of tissue fluid and causes reflex vasodilation and marked hyperaemia. This reduces swelling and helps resolve inflammation. Vigorous kneading decreases muscle spasm and can stretch tissues shortened by injury.

Petrissage

Skin rolling is a forceful technique that can only be applied to fleshy regions of the body. A fold of skin, subcutaneous tissue and muscle is squeezed, lifted and rolled against the underlying tissues in a continuous circular motion. With each cycle, the hands progress on to adjacent tissue, taking care not to drag uncomfortably on the skin. Petrissage is particularly useful for stretching contracted or adherent fibrous tissue and will relieve muscle spasm. Acting more deeply than kneading, petrissage also promotes the flow of body fluids and can resolve long-standing swelling.

'Wringing' evolved from the simple rolling petrissage described above; superficial tissues are grasped in both hands and twisted in opposite directions. 'Picking up' involves lifting and stretching soft tissues away from underlying tissues. These variants of the original technique represent a more localized application and allow treatment of injuries in delicate soft tissue lying over superficial bone, such as an anterior tibial muscle strain.

Frictions

Frictions are an accurately delivered penetrating pressure applied through the fingertips. The movement is mainly circular or transverse relative to the alignment of the underlying structures (*Figure 2*) with minimal lateral movement. Frictions are aimed directly at the site of damage. Tendons and ligaments are treated under slight tension, while muscles are best manipulated in a relaxed position, thus avoiding excessive damage to the muscle cells.



Figure 2. Frictions

The firm pressure needed for frictions is transmitted through the index finger reinforced by the middle finger. Larger areas are treated using the index, middle and ring fingers of one hand supported by those of the other. Friction massage begins with initial gentle transverse movements that gradually bear more deeply into the tissue and continue for 5–15 min. Frictions do not attempt to soothe, but instead cause mild tissue destruction, a marked local hyperaemia and an inflammatory reaction.

Frictions are very useful in sports therapy, especially for the treatment of adherent or contracted connective tissue. Contracted tissue often significantly reduces athletic performance. The localized stretching and degradation of collagen caused by frictions can restore fibres to a more normal alignment during the remodelling phase of healing¹³. Function often improves greatly provided that healing is accompanied by correct joint positioning and gentle exercise.

This massage technique will also temporarily reduce pain by activating the 'pain gate' mechanism^{14, 15}.

Tapotement

Tapotement is the name given to percussive massage techniques. The purpose of these vigorous applications, often misunderstood, is to vibrate tissues, trigger cutaneous reflexes and cause vasodilation. Thus muscle tone increases and retained interstitial fluid resulting from injury and inflammation is dispersed. Swelling reduces and healing is accelerated.

Several tapotement techniques exist, the simplest being 'clapping'. The therapist cups the hands and strikes the patient's skin smartly with the concave palmar surface. On impact the hollow space traps an air cushion next to the skin which reduces the stinging sensation and disperses the shock more evenly through the tissues. Modifications of this basic technique, which have the same therapeutic effects, include 'hacking' along the long axis of tissue using the ulnar border of the hand, 'beating' the skin with loosely flexed fingers and 'pounding' with tightly closed fists.

Vibrations and shaking

This type of massage produces yet coarser and more energetic vibration of tissue. 'Vibrations' are delivered by trembling both hands held firmly in contact with the skin. Unlike effleurage, this method compresses swollen tissue and can reduce oedema with less risk of infection spreading within natural channels in the body.

'Vibrations' are also used in chest physiotherapy to disperse mucus from the smaller elements of the respiratory tree and improve respiratory function. The performance of an athlete suffering the after effects of a mild chest infection might thus be improved. The pleural membrane should damp such vibration efficiently, but the demonstrable effectiveness of this technique indicates that the physical principles involved require further research¹⁶.

'Shaking' is a yet more vigorous treatment in which muscle of the chest wall is grasped and shaken forcefully. A physiological effect similar to that of 'vibrations' is produced and the treatment can improve thoracic mobility and assist ventilation. Secretions are expelled directly or ejected by triggering a cough reflex.

Equipment techniques

Devices increasing pressure

Massage using hand-held rollers was widespread after 1880 and is once again popular in fitness centres. There is scant evidence that the technique does more than soothe, an effect likely to depend more upon the masseur than upon the equipment itself. Rollers are the least sophisticated example of a family of devices that compress tissue.

Rhythmically alternating external pressure, applied using warm flowing water, is the basis for many traditional hydrotherapy massage treatments now rarely available within the UK National Health Service. These include 'undercurrent massage' with a powerful underwater jet applied to the skin, 'needle showers' of fine but forceful jets of water directed on to a standing patient and, of course, the whirlpool bath or jacuzzi¹⁷. Hydromassage is often available in fitness clinics and plays an important role in sports rehabilitation, particularly in Southern and Eastern Europe. Hydromassage can cause deep relaxation, soften and debride scarred or hardened skin, and induce generalized vasodilation that accelerates healing of superficial tissues.

Pneumatic external compression, applied using an air-filled cuff or sleeve has a successful history for treating swollen limbs. Modern systems such as 'Flowtron' (Huntleigh Technology, Luton, UK) use an air compressor to inflate and deflate rhythmically a plastic sleeve wrapped around the limb (*Figure 3*). Pulsed pressure changes, within predetermined limits, alternately empty superficial veins and lymph channels into the deep circulation, and then allow refilling. Valves within the deep vessels ensure this unilateral flow.

Some devices encase the limb in a rigid chamber that can be both evacuated as well as pressurized (e.g. Vasotrain; B.V. Enraf-Nonius Delft, Delft,

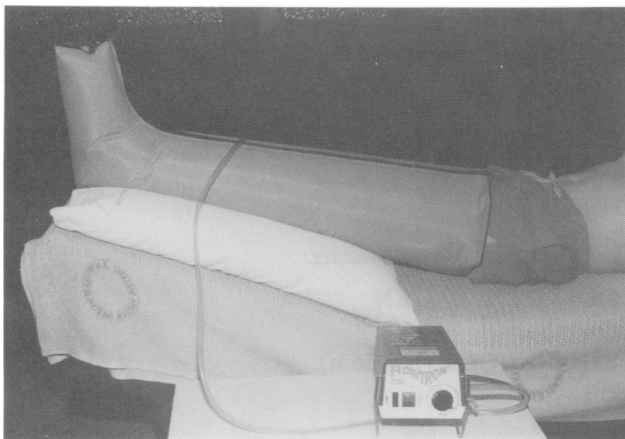


Figure 3. Pneumatic compression

Holland). Some pneumatic systems inflate and deflate a series of cuffs sequentially. The resulting pressure wave can be directed in either direction and at any desired speed. Sequential compression reduces claudication pain and improves skin condition impaired by vascular disease^{18,19}.

These mechanical systems can speed up the early stages of recovery from sports injury by reducing venous congestion and improving blood supply. This quickens the inflammatory process and subsequent healing. The taut sleeve triggers mechanoreceptors in the skin and, by activating the pain gate mechanism, reduces pain and facilitates early mobilization and exercise.

Devices causing vibration

The first vibration therapy, advocated by several famous figures, consisted of a fast ride on horseback. Mechanical devices now offer a safer and more localized vibration treatment. The therapeutic principles involved are similar to those described for tapotement.

The usefulness of coarse vibration devices, often promoted by beauty salons as a way of removing fat, is highly questionable¹⁷. Similarly, the various hand held devices sold to the public frequently produce minimal vibration yet often appear useful for treating musculoskeletal pain. A powerful placebo effect would appear to be at work.

Therapeutic ultrasound operating at frequencies between 1–3 MHz is also a type of vibratory massage. The physiological and therapeutic effects mimic those of conventional massage techniques. This therapeutic modality is used widely in sports medicine and the interested reader is referred to specialized reviews for a more detailed discussion^{20–22}.

Summary

Massage has for many years played an important role in athletic rehabilitation and is enjoying a justified resurgence of interest. Sports therapy can now draw upon an extensive body of research documenting the diverse physiological and therapeutic effects of manual therapy. These will be explored fully in a subsequent article and will be instrumental in establishing massage as a treatment of choice for a wide range of sporting injuries.

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