Manual medicine, manual therapy

Science, clinical application, evidence

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Abstract

Manual medicine is the medical discipline that deals with diagnosis, treatment, and prevention of reversible functional disturbances in the locomotor system and other related organ systems. The current article illustrates neuroanatomical and neurophysiological fundamentals of the mechanisms of manual diagnostics and treatment. Based on the recent literature and consideration of different scientifically based clinical guidelines, the evidence-based effectiveness of manual therapeutic procedures is presented. Acute and chronic low back pain, cervicogenic headache, neck and shoulder pain, radicular arm pain, dysfunctional thoracic pain syndromes, diseases of the rotator cuff, carpal tunnel syndrome, and plantar fasciitis are included. Clinical case studies illustrate the clinical procedures. The term, the origin, and the clinical presence of “osteopathy” are addressed in detail, and the national and international societies of manual medicine (*Deutsche Gesellschaft für Manuelle Medizin* [DGMM], European Scientific Society of Manual Medicine [ESSOMM], *Fédération Internationale de Médecine Manuelle* [FIMM]) are portrayed lexically. Finally, contraindications to manual intervention are presented and an outlook on the requirements and possibilities of scientific pain analysis is given in accordance with the preamble of the *Deutsche Gesellschaft für Orthopädie und Orthopädische Chirurgie* (GSOOC) guidelines on specific low back pain.

Keywords

Musculoskeletal manipulations · Osteopathic physicians · Manipulation, spinal · Pain perception · Neurophysiology

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Manual medicine is the medical discipline that comprehensively deals with diagnosis, treatment, and prevention of reversible dysfunctions of the locomotor and associated organ systems.

Targeted functioning of different systems of the human body comprises a complex and finely tuned harmony of afferents and efferents. This interaction is under intensive control at the segmental level through descending pathways from higher centers (brain stem and all parts of the brain above it). Ascending paths carry information as feedback from the result of the movement in the sense of cybernetic systems towards the center [19].

If one or more elements of this interaction result in setpoint adjustments due to

externally or internally caused disturbance variables, initially reversible—later permanent—malfunctions and ultimately structural changes occur. Numerous clinical symptoms and disorders follow this pathogenetic pattern. In the courses for obtaining the qualification “Additional training in manual medicine,” great importance is attached to this pathogenetic knowledge of these pathogenetic patterns [35].

Why are practitioners of manual medicine and manual therapists working to their limits? Why are prescriptions in orthopedic/trauma practices requested by patients with an emphasis that is second to none? Who does not know the unpleasant discussions with the statutory health insurance?

Fig. 1 ▲ Nociceptors arriving from the periphery generate reactive changes in motor coordination via axon collaterals of the multireceptive dorsal horn to motor neurons in the anterior horn. CNS central nervous system. (With kind permission from ©Prof. H. Locher, didactic graphic D. Deltschew. All rights reserved)

Abbreviations	
AWMF	Association of the Scientific Medical Societies in Germany
CNS	Central nervous system
CRPS 1	Complex regional pain syndrome 1
DGMM	Deutsche Gesellschaft für Manuelle Medizin
ESSOMM	European Scientific Society of Manual Medicine
ETRs	European training requirements
FIMM	Fédération Internationale de Médecine Manuelle
GSOOC	Deutsche Gesellschaft für Orthopädie und Orthopädische Chirurgie
MCP	Metacarpophalangeal joint
MRHHN	Multireceptive dorsal horn neuron
NSAIDs	Non-steroidal anti-inflammatory drugs
PTR	Pattern training regulations
SAMM	Schweizerische Ärztegesellschaft für Manuelle Medizin
UEMS	Union Européenne des Medecins Specialistes

In his very readable book *Die verlorene Kunst des Heilens* (The lost art of healing), Bernhard Lown (American cardiologist, *1921) [27] quotes Thomas Lewis, who writes in his book *Youngest Science* [20]: "Touching is the oldest and most effective tool in medical practice." Lown writes: "The conversation at the first interview is often quite impersonal. But the relationship between doctor and patient often changes dramatically after the physical examination." Which discipline is still intensively investigating physically today? The examples described below are known to all of us from daily practice. No imaging method really helps with the diagnosis, only secondarily, if at all. Diagnosis is essentially set "manually"!

Clinical examples

- If an inflamed appendix sends persistent nociceptive afferents to the spinal

cord, a hypertonicity of the abdominal wall (defensive tension) occurs through reflex interconnection.

- Sends a lumbar intervertebral joint by sudden overload, e.g., "overlifting" or over-rotation, a strong nociceptive to the spinal cord, there is a spastic contraction of the low and intermediate layers of the spinal muscles, that is sometimes a very painful limitation of movement in the segment (blocking in the sense of vertebral protective reflex) [21]
- If dental treatment with subsequent changes in occlusion leads to incorrect loading of the temporomandibular joint, changes in motor patterns and functional disorders in the upper cervical spine can occur via afferents from the masticatory muscles (V3, mandibular nerve) and cause, e.g., neck pain and headaches [14].

Fig. 2 ▲ Schematic drawing of the pathways of sympathetic system activation. *CNS* central nervous system. (With kind permission from ©Prof. H. Locher, didactic graphic D. Deltschew. All rights reserved)

- If segmental functional disorders in the lower cervical spine result in minimal delays in activating the supraspinatus muscle in relation to the deltoid muscle, excessive pressure on the supraspinatus tendon with corresponding pain (functional impingement) occurs at the beginning of the abduction [4]. This can lead to chronic inflammation, tendon degeneration, and supraspinatus lesions/ruptures in the long term.

Manual medicine addresses such functional disorders:

Using suitable techniques, the trained hand of the therapist is able to intervene in the reflex control circuits by generating proprioceptive afferents from various structures.

Pain-inhibiting systems are activated, and it is often possible to break the control loops of nocireactive dysregulation. In exceptional cases, mechanical jamming

of certain articulated osseous functional units can be resolved directly. (*Note: this mechanism does not apply to the inflamed appendix in the first example*).

Note

Basic medicine/manual therapy targets the modulation of the pattern of systemic afferents and efferents to eliminate dysfunction in the affected control loops.

Neurophysiological background of dysfunction and chronification [23, 33]

Results from various fields of basic research (neurophysiology, neuroanatomy, neuropharmacology, myofascial pain research, anesthesiology, and algesciology) in terms of translational research are presented, discussed, and consented (at the initiative of the *Deutsche Gesellschaft für Manuelle Medizin* [DGMM] and the *Schweizerische*

Ärztegesellschaft für Manuelle Medizin [SAMM]) in international symposia as foundations of manual medical diagnosis and treatment [18, 25].

The following attempted explanations and diagrams on important key pain medicine and functional terms achieve "a degree of simplification that is at the limit of tolerance, but basically the statements remain very close to the scientific content and are reliable" (Walter Zieglängsberger, Max Planck Institute for Neuropharmacology, Munich).

The author of the present article and numerous long-time experienced manual physicians have internalized this content into daily diagnostic and therapeutic activities, and thus achieved an advanced specification of the differential diagnoses and, above all, an improvement in detailed differential therapeutic planning. This also and above all includes finding the indication for manual medical interventions.

Fig. 3 ▲ Afferents from different tissues converge on a dorsal horn neuron. This is why it is often called wide dynamic range neuron. CNS central nervous system. (With kind permission ©Prof. H. Locher, didactic graphic D. Deltischew. All rights reserved)

Motor system activation

The organism reacts to nociceptive stimuli via metameric and central interconnections in the sense of nocireactive motor system activation (■ Fig. 1).

Clinically, there is a pain-related motor coordination disorder (e.g., abdominal muscular defense, protective extremity reflex, gait disorder with activated coxarthrosis, malposition with lumbar spine blockage, signs of muscular imbalance).

Sympathetic system activation

Axon collaterals of the posterior horn neurons also excite sympathetic origin neurons in the thoracic lateral horn and generate vegetative efferents (■ Fig. 2).

Clinically, the following can occur: changes in skin blood flow, piloerection, increased sweat secretion, tachycardia, increase in blood pressure, etc. There are also routes of parasympathetic dysregulation via the vagus and the pelvic nerves. An extreme form of sympathetic system activation is the complex regional pain syndrome 1 (CRPS 1, formerly Sudeck dystrophy).

Convergence

At the multireceptive dorsal horn neuron (MRHNN), not only afferents from the respective vertebral joints converge, but also afferents from various regions that are each assigned to a segment, i.e., afferents from

skin, muscles, tendons, and internal organs (■ Fig. 3).

According to this, nociceptors from non-vertebral structures in the common final path of motor system activation can also lead to vertebral dysfunctions, for which there are numerous clinical examples (lung cancer, thoracic spine blockage, adnexitis, lumbar spine obstruction, prostatitis, sacroiliac joint blockage, etc.). *Clinical note:* the first symptom of pancreatic cancer can be a recurrent thoracic spine obstruction.

Peripheral sensitization

If a nociceptor is permanently stimulated above the threshold by a sustained noxious stimulus (e.g., UV radiation, me-

Fig. 4 ◀ Mechanisms of central sensitization. (With kind permission from ©Prof. H. Locher, didactic graphic D. Deltschew. All rights reserved)

chanical overload of a joint or vertebral joint, or compression of the nervi nervorum), it changes its biochemical behavior (■ Fig. 4). It secretes neurokinins (substance P, calcitonin gene-related peptide, etc.) into the extracellular space, which in turn trigger the so-called inflammatory cascade.

Phospholipase A2 (PLA2) dissolves arachidonic acid from the membranes, cyclooxygenase 2 (Cox 2) converts arachidonic acid into prostaglandin E2, which attaches to receptors of the same nociceptor and increases the sensitivity of the nerve there. Thereby, the threshold of the nociceptor is lowered and at the skin contact and the joint, movements are painful. The neurokinins also produce vasodilation (rubor) and extravasation (tumor), and, thus, in addition to lowering the stimulus threshold (dolor) and occasionally converting proprioceptive into nociceptive afferents (functio laesa), create the full picture of inflammation, namely neurogenic inflammation. In the case of neurogenic inflammation, manual medical interventions do not work; preparatory pharmacotherapy is required here. *Clinical/therapeutic side glance:* PLA2 is inhibited by steroids, Cox 2 is inhibited by non-steroidal anti-inflammatory drugs (NSAIDs).

Long-term nociceptive influx also causes sensitization processes in the spinal cord, which are essentially comparable to the processes at the nociceptor during peripheral sensitization (■ Fig. 5). The processes in the spinal cord can be regarded as much more complex and complicated, since microglia, mast cells, astrocytes, and neurovascular complexes are also involved to a large extent. Here, too, the starting point of these processes is the secretory activities of the afferent fibers, and the central, non-inducible Cox 2 also plays an essential role in the synthesis of the centrally active prostaglandin E2.

The contemporary terminology for sensitization of the spinal cord is *neurogenic neuroinflammation* according to Sandkühler [36]. *Clinical significance:* nociceptive influx is intensified, pain-inhibiting mechanisms are weakened, nociceptive receptive fields increase (pseudoradicular radiations, Head's zones, referred pain), inhibitory receptive fields are reduced, and the psychoaffective components of pain perception are intensified: fears and dysphoric states increase [1, 36].

In terms of treatment, the focus here is on centrally effective NSAIDs, acupuncture, and suitable proprioception produced by manual medicine.

Note

Mechanisms of peripheral and central sensitization are seen as chronification factors and essentially determine the clinical symptoms as well as differential diagnostic and therapeutic considerations.

Inhibitory systems

In addition to the opioidergic and serotonergic descending inhibitory functional systems, the GABAergic inhibition system plays an important role in manual medicine (■ Fig. 6). By generating proprioceptive afferents (touch, massage, physiotherapy, movement in a pain-free space, manipulation, and mobilization), pain-inhibiting action potentials are generated in GABAergic interneurons, which reduce the level of activity of the multi-receptive dorsal horn neurons and thus weaken the conduction of nociceptive excitations.

In addition to the possibility of manually releasing mechanical deadlocks, this manual medical possibility of intervening in neurophysiological pain regulation is likely to play an even more important role in explaining manual medical effects. This does not only seem to have a segmental effect, since a corresponding study has shown an increase in the pressure pain threshold even in places far from the manipulation

Fig. 5 ▲ Mechanisms of central sensitization. CNS central nervous system. (With kind permission from ©Prof. H. Locher, didactic graphic D. Deltschew. All rights reserved)

[4]. The neurophysiology of pain inhibition in general has been known for a very long time [35], but has only recently found its way into differential treatment planning [15, 24]. Clinically, all functional methods also target the pain-relieving systems.

Note

All forms of manual therapy and many other functional therapy methods aim, among other things, at influencing pain-inhibiting systems [25].

Basically, manual therapy always has three components that cannot be separated from one another, since the subsystems are intensively networked with one another.

1. Mobilizations, manipulations and massages induce an afferent pattern which, if it is intense enough, activate the pain-inhibiting systems.

2. Likewise, blood circulation is promoted (massages, mobilizations, etc.), the milieu of the interstitial space is antinociceptively influenced by the blood circulation, thereby also changing the inflammatory situation, triggering immunological reactions, stimulating the signaling substance production of the fibrocytes, triggering the myocytes to release neurotransmitters. All of these active components were also “previously” causes of inflammation and obviously not adequately controlled by an intervention.
3. For example manipulations, ... eliminate functional disorders at least partially or, at least for a certain time, completely. This depends on whether the coordination is treated in parallel or whether there are already maladaptive changes in the joint and movement segment structures.

Every treatment technique triggers both the activity of the pain-inhibiting systems (afferent pattern) and the peripheral nociceptive causes.

Any therapy that focuses on pain will/should have an intensity-dependent antinociceptive effect. High intensities are necessary for this. At the same time, it will and should reduce the causes of pain.

Note

The nociceptive afferents must be removed from the brain in order to react structurally and functionally in a reorganizational manner [37].

Osteopathy

In the present context, it is necessary to critically appraise the term “osteopathy”

Fig. 6 ▲ GABAergic interneurons as mediators of inhibitory activity through proprioceptive influx. CNS central nervous system. (With kind permission from ©Prof. H. Locher, didactic graphic D. Deltschew. All rights reserved)

as a component and extension of manual medicine [7]:

Definitions and rules

There is no clear, globally accepted definition for terms such as “osteopathy,” “osteopathic medicine,” and “osteopathic treatment.” In the USA there is the Doctor of Osteopathy (DO) profession, which corresponds to that of the German physician with all rights and obligations after completing an ultimately equivalent degree in medicine. There is no other comparable title anywhere else in the world.

Osteopathy in the sense of combining diagnostic and therapeutic methods is practiced in different European countries and also worldwide by different professional groups (doctors, physiotherapists, masseurs, alternative practitioners, and also lay therapists). Training courses,

qualifications, and application standards are therefore highly heterogeneous.

In Germany, the German Medical Association regards “osteopathy” as a component and extension of manual medicine and, with the report “Scientific evaluation of osteopathic procedures” formulated in 2009 [7], set standards for medical training and medical practice of osteopathic procedures. Osteopathic medicine and osteopathic procedures are used by specialists after additional training in manual medicine and billed by private doctors. They are not part of the statutory health care provision within the framework of the Uniform Assessment Standard (EBM) in Germany.

Many physiotherapists and masseurs apply diagnostic and therapeutic osteopathic techniques on medical prescription at their own responsibility. However, primary access to the patient (for non-

doctors) requires a professional license as a non-medical practitioner.

The essence of osteopathy

The term was introduced to the medical arts in the US by the American doctor Andrew Taylor Still in the second half of the century before last. The osteopathic philosophy is based on three principles:

1. All the different functional systems within the body are combined closely and cannot be considered in isolation.
2. Medicine has to concentrate very much on the self-healing powers of the organism and promote them.
3. Exclusively the hands are used diagnostically and therapeutically.

The term “philosophy” in connection with medicine is understood semantically much more narrowly in American than the term “philosophy” in Europe. The medical pro-

Infobox 1

Additional training in manual medicine

The pattern training regulations (PTR) of the German Medical Association [9] formulated for the diploma "Additional training in manual medicine" have the following definition:

In addition to specialist medical expertise, the PTR Manual Medicine includes the detection and treatment of reversible functional disorders of the movement system including their interactions with other organ systems by means of manual examination and treatment techniques.

Minimum requirements according to § 11 of PTR:

Specialist certification in an area of immediate patient care—320 h of advanced training in manual medicine in accordance with section 4, paragraph 8, or 12 months of further training under authorization at further training institutions (only implemented in this way in a few regional medical associations).

fession in conventional medicine is therefore very cautious about the term "philosophy of osteopathy." The German Society for Manual Medicine (DGMM) has therefore replaced the term "philosophy" (construct of ideology) with "osteopathic concepts," which is much more compatible with German specialist medicine. Due to the lack of definition and the extreme heterogeneity of all factors, "osteopaths" are viewed critically by specialists in large parts of Europe (but not by patients!) and, in large circles, quite negatively.

Terminology

In osteopathic terminology, three different systems are essentially described:

The parietal concept. This includes bones, joints, fascia, muscles, and connective tissue and the associated peripheral vessels and nerves.

The visceral concept. This includes the internal organs and their connective tissue suspensions.

The craniosacral concept. This includes central nervous structures, cranial sutures, meninges, and spinal cord membranes based on the assumption of specific inherent rhythms of the human organism.

Global scientific literature [7] was able to demonstrate satisfactory evidence only

Infobox 2

Organization

The German Society for Manual Medicine (DGMM), Association of the Scientific Medical Societies in Germany (AWMF), represents manual medicine scientifically, in terms of further training and professional policy in the context of the design and further development within the reality of medical care.

- Dr. Karl Sell Medical Seminar Neutrauchburg e.V. (MWE), Isny
- German Society for Musculoskeletal Medicine e.V. (DGMSM), Hamm, Boppard
- Medical Association for Manual Medicine (ÄMM), Berlin

The member societies of the DGMM are non-profit scientific societies for the promotion of science, teaching, and patient care in the area of manual medicine, and together they oversee approximately 8000 medical specialists as full members. This makes the DGMM the largest association of doctors in manual medicine in Europe and the world.

The European Scientific Society of Manual Medicine (ESSOMM):

In addition to the Federal Republic of Germany, manual medicine for medical care from a doctor has found entrance mainly in Switzerland and Austria. There, the medical qualification as an additional training is regulated by law. In all other European countries, there are different quality criteria and smooth transitions in the application between doctors and other therapists.

The ESSOMM was founded in 2005 to define common European standards for the content and training curricula of "Additional competence in manual medicine" (corresponds to "additional training" in Germany) for medical specialists. Today, 16 scientific societies from 12 European nations are organized in the ESSOMM. ESSOMM represents around 14,000 European specialists who use manual medicine.

Union Européenne des Medecins Specialistes (UEMS):

The UEMS bundles all scientific societies in Europe into so-called sections, and interdisciplinary activities into multidisciplinary joint committees. It defines the so-called European training requirements (ETRs) for specialist disciplines (e.g., orthopedics and traumatology, obstetrics, dermatology, etc.) and the ETRs for so-called additional competences (manual medicine, sports medicine, algology, etc.).

The manual medicine ETRs were approved by the sections within the framework of the UEMS Council in Larnaka, Cyprus, in 2015, after a long-term discussion and harmonization process, and can be found on the UEMS homepage at [http://UEMS/Documents/Manual Medicine](http://UEMS/Documents/Manual_Medicine).

So manual medicine is a part of scientific university medicine used by physician specialists exclusively.

for the parietal concept. Evidence for visceral and craniosacral concept is scarce.

The term "parietal concept" also corresponds fully to what maps the contents of the pattern course book Manual Medicine in the educational system of the Federal Medical Council [9]. The evidence for the visceral concept is much weaker.

Messlinger in Erlangen recently found nerve fibers that run from the meninges in the inside of the skull through the cranial sutures to the outside, e.g., into the temporalis muscle [34]. Probably clinically relevant in headache and craniomandibular dysfunction.

In addition, osteopaths within the group of health professions, often after several years of full-time training, have similar impressive skills as physicians using manual techniques in the sense of the integral assessment of symptomatic dysfunction and they have great manual skill in influencing the organism therapeutically. This is why their quite

respectable success in the treatment of painful dysfunctions for many patients is understandable.

A real demarcation from manual medicine is not possible. Significantly, the leading standard textbook of US osteopathy is named *Greenman's Principles of Manual Medicine* [11].

Conclusion

Osteopathy is part and an extension of manual medicine [7].

Treatment techniques[2, 38]

The following techniques are mainly used:

- Massage, special massage
- Axial and vibratory traction of the spine and joints
- Mobilization
- Manipulation
- Muscle energy techniques, (post-isometric relaxation) muscle stretching

Infobox 3

Contraindications to manual medical interventions:

Absolute contraindications:

- Fresh trauma
- Osteoporotic fracture
- Bacterial inflammation
- Destructive or stability-threatening tumor
- Systemic inflammatory disease in the episode
- Structural instability of the spinal segment

Relative contraindications:

- Osteoporosis
- Severe degenerative changes in the spine
- Hypermobility
- Florid radicular symptoms
- Excessive passive expectation of treatment and a lack of cooperation in a complex treatment regimen with the need for the patient to assume responsibility

- Strain/counterstrain technique
- Myofascial release technique
- Visceral techniques

Treated disorders and diseases

The following presents a small selection with reference to current studies.

Tension headache

Manual therapies (soft tissue techniques and neuromobilization) can significantly reduce the frequency, duration, and intensity of chronic recurring tension headache, ideally in a combination of both procedures [13]. In non-drug therapy of chronic tension headache, there is good evidence for manual therapy. A series of six treatments of 15–20 min appears to be sufficient and also economical.

Cervicogenic headache

In a small but very correctly conducted study [8], the verum and placebo groups showed clear improvement in clinical symptoms after 3 months of manual therapy and performed better than the control and placebo groups. The work of Goadsby impressively depicts the anatomical and neurophysiological basis of cervicogenic headache and also explains the manual therapeutic effects [10, 14].

Trigeminal neuralgiform pain conditions in the face

Cervicotrigeminal convergences repeatedly lead to neuralgiform pain in the area where the trigeminal nerve spreads and can be favorably influenced by manual regulation of the upper cervical spine [14].

Neck pain, cervicobrachialgia, cervicodorsalgia

A three-arm randomized controlled study with 88 test persons [6] was able to show that grip strength in chronic cervical arm pain improves significantly after a single manipulation. The pain could not be improved with one treatment; conditions with signs of central sensitization (pain radiation not radicular) require multiple treatments in the multimodal concept.

The positive influence on grip strength, however, shows a positive influence on the phenomenon of central sensitization and thus also, as numerous personal experiences show, on the processes of central pain amplification.

Radicular arm pain

According to the German S2k guideline “Cervical Radiculopathy” (registration no.: 030/082) of the AWMF [31], after imaging and neurophysiological exclusion of nerve compression with motor deficits, treatment should be multimodal conservative. In addition to analgesia, physiotherapy, and pain management training, this approach also includes manual techniques: manual traction and mobilization of the cervical spine can be used after the exclusion of contraindications. Impulse manipulations should not be used in cervical radiculopathies caused by degeneration. The consensus confirms the finding that manual techniques in chronic degenerative diseases rather than monotherapy, but essentially should be applied as multimodal combination treatment for a mean period of several weeks.

Chest pain and back pain

Acute thoracic spinal dysfunction and/or rib dysfunction can cause dramatic pain conditions, which naturally can also be

very scary with corresponding emotional pain amplification. A short-term exclusion of internal causes of pain is imperative (including cardiac, pulmonary, or abdominal). If manual functional diagnostics then reveal the cause in the thoracic spine, manual therapy with mobilization or manipulation is promising [3].

Case study: water sports

A 38-year-old French teacher came to the practice because of repeated pain in the thoracic spine at a certain point, often in connection with the feeling of “circulatory weakness” radiating into the left thorax, occasionally with nausea and the feeling of cardiac arrhythmias. Cardiologic, pulmonologic, and abdominal surgical examination was performed several times without any pathological findings. MRI of the thoracic spine was without pathological findings. Physiotherapy, training therapy, medication, acupuncture, and hypnosis treatment had no effect on the symptoms, which were repeatedly aggravated by long periods of sitting.

When asked in detail about the start of the pain, an accident while water skiing was reported, where the patient was immersed in the water at high speed. Thereafter, several days of nausea and slowly increasing pain in the middle thoracic region ensued, then several months of pain-free interval, which is why the connection was no longer seen.

Clinic. Full picture of a painful movement disorder with signs of hyperalgesia in th 6 without further pathological findings orthopedically and neurologically.

X-ray thoracic spine. No pathological findings.

Treatment. Decision to attempt a manipulative remobilization, strong looseness phenomenon, complete disappearance of all symptoms within 1 week after intervention.

Comment. Clinically relevant dysfunctions of single spine sections can persist for years and, as in the present case, be accessible to a single manual medical intervention.

Fig. 7 ▲ Technique of the quadratus lumborum muscle stretching in the lateral position. (With kind permission from ©Dr. W. von Heymann. All rights reserved)

Fig. 8 ▲ Technique of rotation manipulation of the lumbar spine here at level L3 in the lateral position. (With kind permission from ©Dr. W. von Heymann. All rights reserved)

Lumbar and lumbosacral dysfunction and pain

For acute, non-radicular loin pain (so-called simple lumbago), more and more high-quality examinations show that manual therapy (with or without impulse) is a useful, effective treatment with rare side effects [5, 30]. One treatment is usually sufficient.

The updated National Care Guideline

The updated national care guideline for non-specific low back pain based on systematic Cochrane review speaks of a "can" recommendation for manual therapy, exercise therapy, and acupuncture. All other non-drug, non-invasive therapies are explicitly not recommended [8].

Literature search and discussions confirm the long experience which has been observed in outpatient practice, namely that many painful disorders of the postural and locomotor organs, including functional disorders of the sacrum joints and chronic low back pain in multimodal assessment, can be based on reversible changes.

Case study: a misstep

History: 56-year-old patient (examination December 2020) reports about 6 months of recurring, load-dependent, sometimes over longer periods (several weeks) per-

sistent lower back pain, especially when walking, standing, and under loads. Sitting and lying down were without any problems. So far occasionally short-lasting lower back pain with overexertion, no relevant concomitant illnesses. In the past few weeks there had been repeated radiating pain to the outside of the thigh on the right to above the knee joint.

When jogging on the sandy beach in July, one leg got stuck in the soft sand and there was a jerky pull on the right leg with a tearing pain in the right back. Severe pain for 3 days, continued on vacation with ibuprofen, low back pain has never completely gone away since.

Clinic. Straight-leg raise test (SLRT) and Bragard negative, sensitivity, motor skills, reflexes normal, severe paravertebral tenderness L5/S1 right, left rotation sensitivity L5, skin hyperalgesia in the lumbosacral region.

X-ray lumbar spine in two planes. Discrete spondylosis L5 and S1, interruption of the interarticular portion L5 on the right, first-degree spondylarthrosis lumbosacral.

Diagnosis. Persistent, load-dependent lumbar pain with lumbosacral instability due to unilateral spondylolysis L5 on the right and persistent segmental lumbosacral dysfunction after axial traction-distortion trauma.

Treatment. After muscle stretching of the quadratus lumborum and unspecific rotational mobilization of the lumbar spine, manipulative right rotation of L5. L5 rendered a loosening phenomenon followed by a subjectively significant improvement of mobility after three days a return to the state before jogging on the beach.

Comment. Substantial structural changes can also cause persistent dysfunctional pain conditions based on the neuroregulative processes that are accessible to manual therapy. This also applies to disorders of movement reflexes in spondylarthrosis, intervertebral disc protrusions, and spinal stenosis, although no claim is made to successfully treat the underlying disease manually. Often, however, a noticeable clinical and functional improvement of the symptoms can be achieved by eliminating the accompanying dysfunction ([29]; **Fig. 7 and 8**).

Detailed instructions and illustrations of the most common manual techniques can be found in [2, 38].

Note

The indication for manual therapy always follows the criteria of "good clinical practice" in the sense of full medical specialist responsibility.

- Detailed medical history
- Subtle clinical, functional, and neurological examination
- If necessary, imaging and other apparatus-based diagnosis

Fig. 9 ◀ Joint play movements and functional movements in a metacarpophalangeal joint (MCP). (With kind permission from ©Prof. H. Locher, didactic graphic D. Deltschew. All rights reserved)

– Appreciation of psychosocial context factors!

Pain analysis. The diagnosis of painful disorders of the spine and extremities should always follow the rules of systematic pain analysis:

1. Identification of the nocigenerator
2. Identification of motor and autonomic and mental reflex response
3. Degree of activation of the chronification mechanisms
4. Condition of the inhibitory systems

considering the patient in his overall psychosocial context [16, 22, 26].

Manual therapy on extremity joints

Movement restrictions and painful movement disorders in extremity joints are a daily challenge for all disciplines dealing with the locomotor organ. Such changes can occur post-traumatically, post-inflammatorily, and degeneratively, and require rehabilitation treatment.

Pathogenetically, shrinkage of the joint capsule, osseous deformation, and reactive muscle shortening are the cause, individually or in combination. The forced attempt to improve functional movement usually leads to pain and a reactive in-

crease in the restriction of movement. Manual therapy therefore deviates to the field of joint play movements and seeks atraumatic improvement in the area of functional movements by means of an increased mobility in joint play ([4]; ■ Fig. 9 and 10).

Mobilization in the space of the joint play movements allow an expansion of the entire range of motion of a joint and thus bring about an improvement of the functional movement without stimulation of nociceptive afferents.

In addition, a mobilizing movement close to the joint gap at 1 Hertz causes:

- Detonation of the muscles,
- Better cartilage nutrition
- Increase in synovial fluid
- Soothes nociception
- Decrease in nociception
- Expansion of the joint play room
- Consecutive improvement of functional movement
- Induction of a “long-term depression” (pain-inhibiting mechanism in spinal cord neurons) of the central nervous system (CNS) [36].

Note

Through manual medical expansion of the joint play movements, considerable increases in the area of functional movements can be achieved without increasing pain and tension. Manual medicine is therefore an essential factor in post-traumatic and postoperative rehabilitation.

Shoulder pain

In rotator cuff syndromes, local manual mobilization with exercise therapy was significantly superior to other therapies (medication, electrotherapy, kinesiologie tape, spinal manipulation) [17].

In summary. Meta-analysis of all systematic reviews and RCTs for five shoulder diseases that are common in practice resulted in the highest relative evidence (“moderate to good”) for repeated manual therapy in supraspinatus impingement diagnoses [28].

Carpal tunnel syndrome

Randomized controlled trial. 100 patients, complaints longer than 6 months, hypesthesia, Tinel and Phalen signs triple positive. Group 1: 50 classical surgery

Fig. 10 ◀ Difference between “classic” mobilization and manual mobilization. (With kind permission from ©Prof. H. Locher, didactic graphic D. Deltschew. All rights reserved)

(splitting transverse carpal ligament), group 2: 50 manual therapy once a week 30 min.

Results after 12 months. Both groups significantly better than baseline in all parameters, no significant difference between the groups in pain, no differences in temperature sensitivity in the groups.

Conclusion

Conservative therapy for carpal tunnel syndrome with manual therapy is equivalent to surgery [12].

Plantar fasciopathy

In a critical review of all RCTs evaluating their quality, six RCTs of high quality were identified, which were brought together in a meta-analysis. The best results were achieved with a very strong soft tissue treatment such as myofascial relaxation, especially of the calf and the plantar fascia, whereby local pain points in the muscles were also treated with pressure until they disappeared. Joint mobilizations were less effective. Plantar heel pain can be successfully treated manually if the functionally connected area of the calf muscles and their fascia together with the plantar fascia are relaxed by manual pressure treatment (fascial release technique) [32].

Conclusion for practice

The methods of manual medicine (MM) are among the most effective evidence-based forms of treatment for disorders and pain of the spine and limbs. The use of MM follows all the rules of good clinical practice (anamnesis, clinical examination, imaging, laboratory, and special examinations if necessary). MM is only efficient and safe in the hands of specially trained specialists and appropriately trained therapists. MM may only be applied in compliance with all differential diagnostic considerations and observance of the contraindications for MM. Correctly used, MM has a high compliance among patients and is an indispensable part of the diagnostic and therapeutic portfolio of all subjects dealing with the locomotor organ.

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Declarations

Conflict of interest. H. Locher and L. Beyer declare that they have no competing interests.

For this article no studies with human participants or animals were performed by any of the authors. All

studies performed were in accordance with the ethical standards indicated in each case.

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Manuelle Medizin, manuelle Therapie. Wissenschaft, klinische Anwendung, Evidenz

Manuelle Medizin ist die medizinische Disziplin, die sich umfassend mit Diagnose, Therapie und Prävention reversibler Funktionsstörungen am Bewegungsorgan und anderen damit verbundenen Organsystemen befasst. Der Beitrag beleuchtet neuroanatomische und -physiologische Grundelemente der Wirkungsweisen manualmedizinischer Diagnostik und Therapie. Anhand neuester Literatur und Betrachtung verschiedener wissenschaftlicher Leitlinien wird die evidenzbasierte Wirksamkeit manualmedizinischer Verfahren dargestellt. Berücksichtigt werden akute und chronische Lumbalgie, zervikogener Kopfschmerz, Schulter- und Nackenschmerzen, radikulärer Armschmerz, dysfunktionelle thorakale Schmerzsyndrome, Erkrankungen der Rotatorenmanschette, Karpaltunnelsyndrom und Plantarfasziitis. Fallbeispiele veranschaulichen die klinische Vorgehensweise. Die Begrifflichkeit, die Provenienz und die klinische Präsenz der „Osteopathie“ werden ausführlich gewürdigt, und die nationalen und internationalen Vereinigungen und Gesellschaften der manuellen Medizin (Deutsche Gesellschaft für Manuelle Medizin [DGMM], European Scientific Society of Manual Medicine [ESSOMM], Fédération Internationale de Médecine Manuelle [FIMM]) werden lexikalisch dargestellt. Abschließend finden sich Kontraindikationen und ein Ausblick auf die Erfordernisse und Möglichkeiten der wissenschaftlichen Schmerzanalyse, wie sie in der Präambel der Leitlinie „Spezifischer Kreuzschmerz“ der Deutschen Gesellschaft für Orthopädie und Orthopädische Chirurgie (DGOOC) postuliert werden.

Schlüsselwörter

Muskuloskeletale Manipulationen · Osteopathische Ärzte · Wirbelsäulenmobilisation · Schmerzwahrnehmung · Neurophysiologie

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Further reading