HISTORY, BASIS AND TECHNIQUES OF CONNECTIVE TISSUE MASSAGE[1]

by

URSULA LUEDECKE, M.A.P.A.

Connective Tissue Massage has been practiced as a therapeutic procedure for three decades. In Germany, its country of origin, as in most parts of Europe, it is an integral part of Physiotherapy and is taught at every training school. The medical practitioner has accepted C.T.M. as a manual form of neural therapy and prescribes it freely for the benefit of his patients. In English speaking countries C.T.M. is almost unknown, its slow acceptance being due to the following reasons:

1. Our present day knowledge makes it impossible to account on a scientific basis for all the effects gained by the application of C.T.M.
2. The misleading name "Connective tissue massage", by emphasizing the word massage makes the treatment suspect to the medical practitioner and the physiotherapist.

The results of treatment are convincing and are gradually stimulating interest in this method, therefore it is obviously necessary to bring information to a wider section of the Australian physiotherapists. Many C.T.M. investigators have been searching to correlate the beneficial responses obtained by this method, with known physiological facts about the human body. While the inquiry for the rationale of this specialized treatment is still in progress, it is unavoidable that some explanations may err and will have to be discarded or modified as more knowledge is gained.

The term "Connective Tissue Massage" suggests that massage is given to the connective tissue. This is incorrect, the massage is rather a deft manipulation in the connective tissue. The primary aim of C.T.M. is the achievement of responses in the autonomic system, using the tissues as a medium. Therefore the name C.T.M. does not describe the treatment adequately. Nevertheless the title has become the synonym for the tensile strokes in the subcutaneous tissues as developed by Dicke.

Dicke, a German physiotherapist, made the first therapeutic attempts on herself. While suffering from circulatory impairment to her right leg, which resulted in endarteritis obliterans and a suggested amputation, she found connections between her affected leg and subcutaneous tissue in her pelvic region. Trying to relieve the lower back pain accompanying her condition, she applied pulling strokes into the painful areas and palpated tissue tightness over the pelvis. The tension lessened gradually and simultaneously she felt waves of warmth going into her affected leg, as well as sensations of pins and needles. In further treatments she incorporated the area around the trochanter and the iliotibial tract and within three months established satisfactory reduction in her symptoms. After recovery she systematically observed her patients and soon could point out areas of tension in the connective tissue on certain patients. These areas of tension were present when the patient was suffering from malfunctioning organs.

It has been known since the beginning of the century that visceral disease can cause changes in well defined areas of the body surface. Head (1869) described cutaneous hyperalgesia in areas of the body supplied by neurones whose processes terminate in the spinal cord at the same segmental level as

[1] Delivered at the XI Biennial Congress of the A.P.A., Adelaide, August, 1969.

those neurone processes innervating affected viscera. In these areas the patient is sensitive to touch or pressure, heat or cold. The alterations in the cutis are known in literature as "Head zones". They appear during the acute phase of disease and disappear with its normalization. For example, in pathology of the gallbladder, hyperalgesia is found in the segments of T6-10. Mackenzie (1909) observed hypertonic alterations and hypersensitivity in muscle belonging to the same segment as morbid organs. The changes can be found by manual examination of homogenous muscle in relaxation, or by a thrusting palpation, the muscle responding with reflex rigidity. Such a reaction is present in the left upper Rectus in stomach disturbance and in the right upper Rectus in diseases of the Liver-gallbladder system.

The early findings have diagnostic value and some have become familiar to the general practitioner, for example, abdominal tension in appendicitis.

Dicke's independent contribution describes localized tension areas in the connective tissue in the presence of malfunctioning organs. The tension is apparent by a certain immobility of the different layers against each other, where a limited play of movement is normal.

Whilst Head recognized changes in the cutis, Mackenzie in muscle and Dicke in the connective tissue, Vogler found local trophic changes in the periosteum receiving the same segmental innervation as affected viscera. In fact all parts of the same segment are subject to changes in the presence of diseased viscera, including the vascular structures. In 1946 Rouanet investigated, microscopically, disturbances in capillaries located in dermatomes associated with the root supply of pathological affected organs. The changes may affect all structures in the same segment, or they may be noticeable only in one or the other.

Many theories have been advanced to explain the phenomenon of referred pain, muscular rigidity and autonomic manifestations. One of the earliest theories is the Central Convergence theory, already postulated by Head and Mackenzie. According to this theory, it is supposed that a pool of secondary neurones in the spinal cord is common to visceral and somatic impulses. These neurones are normally being bombarded by impulses arising from the body surface, but do not create enough activity in the pool to cause discharge along the ascending spinal tracts to conscious recognition. A sudden influx of visceral afferents activate certain neurones to discharge and lower the threshold of others. The usual impulses arriving from somatic structures are then sufficient to bring these neurones to discharge. Misinterpretation of the source of pain is due to the poor visceral localization ability and impulses may be projected into somatic areas. Muscular rigidity and the autonomic phenomena of visceral disease are explained by simple reflex arcs at a spinal level. (*See* Fig. 1.)

The affected areas are known as *reflex zones*. The reflex zones are located homolaterally in the segment of the affected organ. They usually do not occupy the segment uniformly but certain areas within the reflex zones are particularly noticeable. Already described by Head, they are circumscribed areas within the affected dermatome and are called *maximal points*. Maximal points are also present in the myotome and in the connective tissue.

It has been assumed that the reflex zones have been built to surround and to protect the affected organ (*défense musculaire*), just as it is known from the musculo-skeletal system in conditions affecting the joints. While this may be true for some visceral disease, for example, the reflex contraction of the abdominal wall in response to certain disease processes in the abdominal viscera, this concept cannot explain the fact that changes on the body surface may influence the organ by a reversed process. There is extensive literature available on the Continent discussing pathological and functional conditions of organs, caused by pathological alterations in somatic structures, for example, Gross and Nonnenbruch observed that in the presence of scar tissue pathological conditions were found to exist in the gallbladder and elsewhere in the body; Kohlrausch describes how

hypertonic changes in muscle fibres of the pectoral muscle, caused by strain at work, were responsible for heart symptoms in masseurs. These briefly mentioned observations are known as *somato-visceral* reflexes and indicate that a change in one part of the segment may affect the function of other structures belonging to the same spinal nerve supply.

Since ancient times mankind has tried empirically to influence morbidity in organs by treatment of the body surface. Hydrotherapy and counter irritation have been used for centuries and have become time honoured methods in medicine. Nearly everyone has at one stage or another experienced the soothing warmth of a simple hot water bottle, when suffering from some minor disturbance. It is

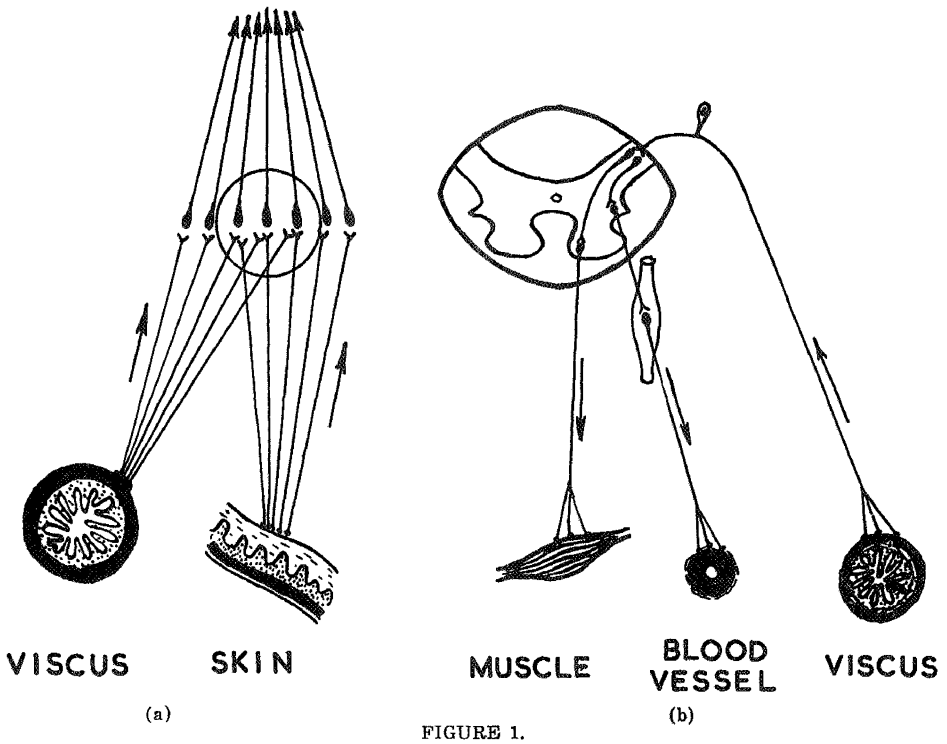

FIGURE 1.

The neurological basis for manifestations of visceral disease associated with referred pain.

(a) Cutaneous hyperalgesia. Impulses arising from the diseased viscus lower the threshold for the cutaneous sensory impulses at the common pool of sensory neurones.

(b) Muscular rigidity and vasometer reflexes are caused by the excitement of simple reflex arcs at a spinal level.

Reproduced from the Australian and New Zealand Journal of Surgery, May 1961, 30, 4.

If changes in the opposite direction are possible, the reflex zones should have therapeutic value as well. This was effectively argued by Kohlrausch in 1959. He drew attention to the hypertonic changes in muscle and describes a series of reflex zones and their maximal points. He deduced from the patient's slow recovery process that the reflex zones themselves were holding back improvement and were even instituting new flare ups. He advised gentle vibrations to dissolve the hypertonus and could demonstrate that this treatment resulted in lessening and disappearance of the patient's symptoms.

impossible that the heat reaches the internal organ, yet comforting responses are received. There is experimental evidence available that segmental irritation of the cutis can produce impulses, which are received by the organ of the same segmental innervation level. The responsible pathway is known as the *cuti-visceral-reflex*. As reported by Kohlrausch and others, Dittmar experimentally stopped stomach periastalsis and lowered the tonus of the stomach wall in animals, by application of warmth or chemicals (embrocation) to the skin in T5-9. As soon as he severed the left posterior or anterior roots of T5-9,

thereby cutting of the neural pathway, the same medication failed to get a response in the organ in question.

When knowledge of segmental connections became better known, a number of medical treatments were evolved, consciously using the assumed reflex pathway as conductor of beneficial impulses to diseased organs. Injections of novocaine, impletol or oxygen into the hyperalgetic zones became popular, others used ultrasound or massage. Several methods and techniques of the latter have been evolved. Their therapeutic successes show that it is possible to achieve beneficial results by using the reflexly pathological symptoms in skin, muscles, tissues and periosteum as the medium for therapeutic agents. In all instances the aim is to interrupt or normalize a pathological reflex mechanism within the segment.

C.T.M. differs from this concept. From the early beginning it was clear that its mode of action could not be explained purely on the basis of a neurological reflex within the segment. The treatment had other consequences as well, not only influencing the function of organs, nerves and vessels correlated to each other, but causing general constitutional changes.

The systematic development of C.T.M. began in 1938 at a decisive meeting between Dicke, Kohlrausch and Leube in Freiburg. Together they worked out the foundation of what is known today as C.T.M. In 1942 the first result of this fruitful work was published under the title of: "Massage of Reflex Zones in the Connective Tissue in the presence of Rheumatic and Internal diseases".

Before discussing C.T.M. any further, it is appropriate to review briefly the nature of connective tissue.

Connective tissues are commonly known as the binding and supporting structures of the human body. Basically all connective tissues are composed of cells, which are embedded in the ground substance, or matrix. The matrix may contain fibres and a variable amount of fluid. Variations in the tissues are due to the relative proportions of the above elements and their disposition. Loose connective tissue in its areolar variety is easily extensible with air and fluid. It is widely distributed throughout the body and is found in the subcutaneous tissues, around and between muscles, vessels and nerves. It acts as the connecting link between all structures, allowing a considerable degree of movement between them. It forms the scaffolding of organs and the deep and superficial fascia. It plays a significant part in regeneration after injury. Loose connective tissue can be regarded almost as an organ of metabolism, taking part in the regulation of the acid equilibrium, the water and salt and the electrical and osmotic balance. A continuous flow of intercellular fluid containing nutrient substances passes through the connective tissue. Connective tissue is therefore not only the scaffolding for other structures but an important active system in the human body.

Unlike the changes in sensibility and tension in skin and muscle which are noticeable to the patient as they give him discomfort, changes in the connective tissue go undetected. However they can be found on investigation by the pulling finger, recognizing diminished mobility and variations in tension. As the connective tissue is not a compact mass, but consists of numerous interconnected layers it is possible to differentiate between two shifting layers for therapeutic purposes.

1. Between cutis and subcutis (superficial layer).
2. Between subcutis and fascia (deep layer).

The changes in the deep layer cannot only be felt but can be seen by the experienced observer. They appear as a change in the relief of the subcutis. Bandlike drawn-in areas, or flattened planes of tissues are accompanied by elevated areas in the adjoining tissues. The physiological basis for their formation is still uncertain. It seems unlikely that motory contractions of the collagenous fibres are responsible, for the connective tissue is lacking in muscular elements. However it is assumed that a variation of the somatovisceral reflex is responsible for the tension, probably involving efferent vasomotory fibres. That a neural process is involved, is seen in the fact that the tension can diminish as a result of

specific manipulations, only to reappear if irritated contrarily. The elevated areas with their increased liquid contents are probably caused by chemical, humoral processes, as a secondary reaction of the tissues.

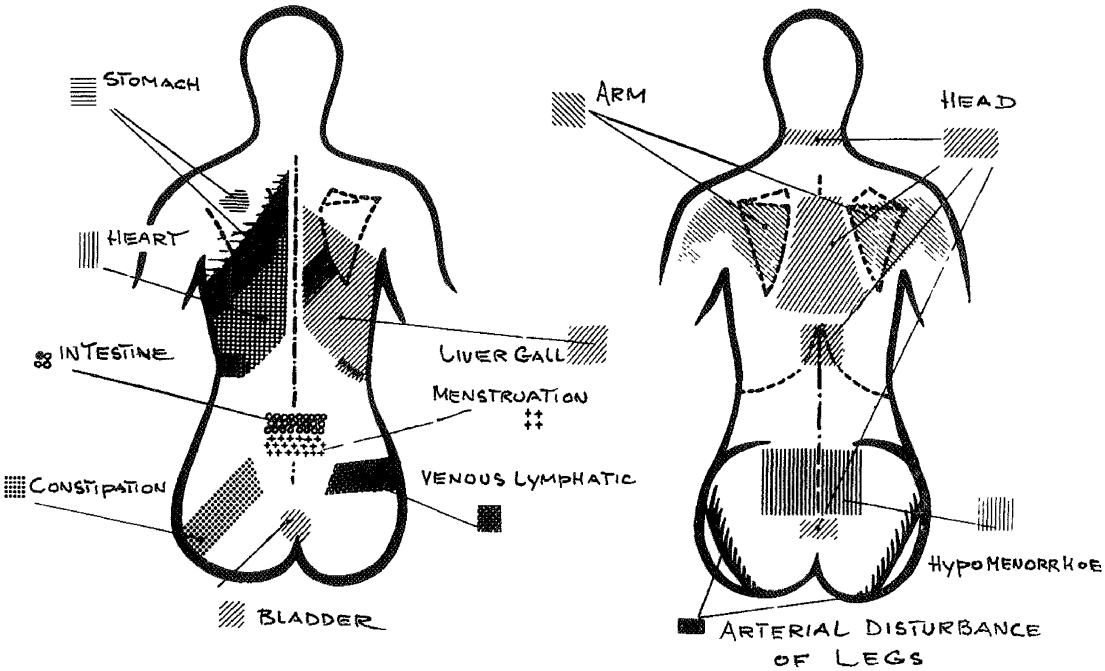

FIGURE 2.

VISIBLE CONNECTIVE TISSUE ZONES

After Dr. Teirich-Leube, with her kind permission.

C.T.M. was first applied on patients with clinically well defined diseases and definite symptoms. Technique and therapy were developed, the formation of zones was observed and their significance became a study. Teirich-Leube and her co-workers in Freiburg finally compressed the observation into a scheme, which is used today as the basis for all connective tissue investigation and treatments. (See Fig. 2.) It is of interest to report that some medical practitioners use it as a diagnostic aid.

Skin, muscle, periosteum and connective tissue zones always appear in connection with acute pathological disturbances. Connective tissue zones in the deep layer are present in chronic disturbances, but may also be present without pathological background. The patient usually had suffered the indicated disturbances earlier in life, or he may have a tendency to suffer them under conditions of stress, for example, constipation while travelling, tension, headaches, *etc.* These zones are referred to as "mute zones" (Leube). It is interesting to note Teirich-Leube's viewpoint; she writes:

"For connective tissue massage the clinically mute zones are of equal, sometimes even of greater importance than those connective tissue zones, which correspond to the acute disturbance and discomfort. We have learned from experience, that the clinically mute zones indicate 'weak spots' in the autonomic nervous system, for example, the weakness of the tissues in the asthenic, the weakness of weightbearing in the delicate joints of the pyknic type of constitution, *etc.* The weak points, consistent with type and autonomic constitution, may become activated during a life time, although they may never play an important part or lead to complaints and disturbance." These clinically mute zones must

under all circumstances be included in the treatment.

The known viscero visceral reflex arcs involve impulses arising in a visceral structure, resulting in activity in other visceral structures. Similar activity is thought to occur between connective tissue zones. It is known empirically that the connective tissue zones have connections with each other, thereby setting up feed back circuits. The therapeutic influences may reach the organ, nerves and vessels innervated from the same segmental level, but may also be received by other connective tissue zones and affect other areas *via* these. For example, parasthesia of the hands often disappears while treating caudal and sacral areas. The observation that intersegmental connections exist was found at an early stage of C.T.M. development. Only after tension in the caudal section had been removed, was it possible to work successfully in cranial areas. This is important for female patients in particular, as most women show connective tissue zones over the pelvic region. This is understandable, as the rhythm of their genital system is very closely connected with their autonomic reactions; even healthy women suffer from premenstrual headaches, tension, constipation, *etc.* Connective tissue zones will therefore be present, which must be included in the treatment. A purely segmental application of C.T.M. is refutable and must be rejected.

The basic manipulation for C.T.M. is a tensile stroke, carried out by the middle, assisted by the ring, finger. In tension areas (Connective Tissue Zones) the pulling finger encounters resistance and a sharp cutting sensation will be felt by the patient. This characteristic cutting sensation cannot be produced by other methods and is assumed to be indicative of a satisfactory neural response. This assumption was made after it became clear that other reactions are occasionally possible. In these cases the patient experiences a sensation of either dull pressure, or of meaningless stroking, in certain areas on his body. The patient may register these described sensations in response to uniform manipulations during the same treatment, in equally tense connective tissue zones. Continuing the strokes in these areas does not bring beneficial results. However, if certain trigger points are stimulated, a change in the patient's reactions occurs and the desired cutting sensation can be obtained.

The manipulations in the connective tissue zones produces *dermographia rubra* (skin reddening) and is followed by *dermographia eleveta* (welts or weals). The stronger the tension, the stronger the skin reactions and the longer their duration, in fact the skin reactions can be seen for up to 36 hours. The skin reactions suggest that a histamine related substance is released by the manipulation and that this chemical change may play a part in the overall reaction to connective tissue massage. Cutting reaction, *dermographia rubra* and *eleveta* are demanded by authorities (Teirich-Leube) as the criteria for the correct technique and a satisfactory neural response. With diminishing tension in the connective tissue, the cutting sensation and the skin reactions lessen considerably and after about 4-8 treatments even a vigorous C.T.M. cannot elicit more than a faint response.

The exception to the rule will be found in peripheral vascular angiospastic conditions as, for example, in Raynaud's disease. The expected reactions can only be obtained very faintly, although the tension in the appropriate connective tissue zones are very high. Only as the condition improves will it be possible to elicit the triple response. However, in cases where a sympathectomy has been performed, the triple response can be obtained immediately.

The manipulations directly stimulate the terminal reticulum. Cutting sensation, *dermographia rubra* and *eleveta* are the direct result of the mechanical stimulus. Several neural and metabolic effects can be observed on the individual patient under treatment. Many patients start to perspire profusely, including the patient who has no inclination towards sweating. This liquid type of perspiration suggests parasympathetic stimulation and is especially marked in women shortly before onset of menstruation. Patients who complain of definite symptoms at the beginning of the treatment, like shortness of breath, palpations, headaches, and so

on, may report their spontaneous disappearance during treatment. While increased urinal output and renal activity are often experienced by the patient, a condition of general fatigue can be expected after the first few treatments. This leads to the assumption that as the result of the treatment, impulses reach the C.N.S., where some may form reflex arcs and others carry the impulses to higher autonomic levels. Thus it is seen that the effects will be:

(a) local, at or near the area of stimulation, that is cutting sensation, *dermographia rubra* and *eleveta.*

(b) segmental, affecting vascular and other structures in the corresponding segment.

(c) general, reaching the autonomic centres and initiating endocrine responses.

Although specific effects are possible in the organ and the segment, clinical experience has shown that a major effect of C.T.M. is a rebalancing of autonomic activity, thereby affecting the whole organism. This is achieved by either decrease in sympathetic or an increase in parasympathetic activity. Consequently C.T.M. is recommended in the treatment of conditions, involving reflex imbalance in the autonomic system, for example:

(a) all functional and many chronic conditions of internal organs and systems;

(b) diseases of circulation insufficiency;

(c) rheumatic and nerve disorders;

(d) dystrophia after trauma.

It is important to stress that it is impossible to confine C.T.M. stimuli to isolated pathways, effecting exclusive structures. Because of the close interrelationship existing between somatic, autonomic and endocrine processes, spreading responses have to be expected.

Besides the normal reactions to C.T.M. transitory irritations may occur. They sometimes appear at the beginning of a treatment, when the tension in the tissues is high and difficult to deal with, *e.g.*, pilor erection, muscle tension and irresistible itching may appear on the body surface and disappear almost un-noticed by the patient. More serious are visceral irritations such as sudden headaches, breathing difficulties or visceral spasm. Patients have been known even to collapse. While the irritations on the body surface are frequent, the irritations in the organs are less frequent and can usually be traced back to faulty technique. The immediate attention to the removal of all irritations is imperative and all adverse reactions can be brought under control. This can be achieved by certain manipulations along the iliac crest, on the sacrum, the trochanter or other known reaction points.

Important factors in achieving beneficial results with C.T.M. are sound anatomical and physiological knowledge, thorough understanding of the effects of the treatment and the command of the specific manipulations in the various displacement layers. However they are not yet uniformly taught. Variations by different teachers are according to the views held by their respective schools. Modern C.T.M. differentiates between three techniques according to the findings in the tissues:

1. Skin technique (superficial technique).
2. Subcutaneous technique (deep technique).
3. Fascia technique (deep technique).

Differentiation is achieved by (a) the depth of the strokes, and (b) the length of the strokes, resulting in various neural and circulatory reactions and effects. The technical part of the method can certainly be learned although it looks much easier than it really is. The mechanical application of certain strokes however cannot be considered neural therapy. Within the framework of the general rules C.T.M. has to be adjusted to the diverse reactions of each patient, requiring not only manual dexterity but the ability to observe and to adapt accordingly.

An effort has been made in this paper to present an introduction to the history, basis and techniques of C.T.M. The data given has been compiled from many sources emphasizing the fact that a great deal of specialised knowledge is available but has not been used by the clinical worker for the benefit of the patient. Unfamiliar forms of treatments, such as represented by C.T.M., introduce a

challenge. All new treatments in fact force evaluation, both of successes and failures and stimulate discussion all of which is invaluable to the further development of physiotherapy. It is in this spirit that C.T.M. can make a real contribution to physiotherapy. In collaboration with the physiotherapist, the medical practitioner will find C.T.M. a valuable adjunct in treatment of his patients.

BIBLIOGRAPHY

DICKE, E., SCHLIACK, H., WOLFF, A. (1969), *Bindegewebsmassage*, Hippokrates Verlag, Stuttgart.

EBNER, M. (1962), *Connective Tissue Massage*, E. & S. Livingstone Ltd., Edinburgh and London.

GLASER, O. (1964), *Segmentmassage*, Edition Leipzig.

HEAD, H. (1893), *Brain*, Vol. 16.

KOHLRAUSCH, W. (1959), *Reflexzonenmassage in Muskulatur and Bindegewebe*, Hippokrates Verlag, Stuttgart.

MACKENZIE, J. (1909), *Symptoms and Their Interpretation*, Shaw & Sons, London.

MCLEOD, J. G. (1961), "The Physiology of Visceral Sensation and Referred Pain", *A & N.Z. Journal of Surgery*, Vol. 30, No. 4.

MITCHELL and PATTERSON (1954), *Basic Anatomy*, E. & S. Livingstone Ltd., Edinburgh and London.

PEELE, T. L. (1961), *The Neuroanatomic Basis for Clinical Neurology*, McGraw-Hill Book Company, New York.

TEIRICH-LEUBE (1964), *Grundriss der Bindegewebsmassage*, Gustar Fischer Verlag, Stuttgart.