FASCIAL MANIPULATION®

Superficial Fascia and Systems

Practical part • Fourth level

Luigi Stecco
with the collaboration of
Carla and Antonio Stecco

FASCIAL MANIPULATION®

Superficial Fascia and Systems

Practical part • Fourth level

Foreword by
BRYAN O'YOUNG
MD, Professor and Vice-Chair of Education
Lewis Katz School of Medicine, Chief of Outpatient PM&R Services
Temple University Health System, Clinical Professor, NYU School of Medicine
Rusk Rehab at NYU Langone Medical Center
Adjunct Clinical Professor, Weill Cornell Medical College
Chief Editor, PM&R Secrets, 4th Edition

English translation by
Julie Ann Day

PICCIN

ISBN 978-88-299-3549-9

www.piccin.it

Foreword

I have always been interested in the human fascia, and it is my greatest pleasure to have met and worked with Antonio Stecco, the son of Luigi Stecco, considered one of the pioneers in the field. I am honored to be invited to write the foreword for Fascial Manipulation Practical Part Level IV: Superficial Fascia and Systems, edited by Piccin Nuova Libraria.

As the former president of the American Academy of Thermology, I look forward to the insights that this new book will bring regarding vascularization of the superficial fascia, the vital shunts between arterial and venous systems, and the differentiation among body regions. This data will assist in explaining many of the patterns from thermographic studies.

It is now evident that the upper back and neck have a superficial fascia with a high concentration of vessels that enhance thermographic signals. The new information from Steccos' books, and in particular this book, will further enlighten the reader on the critical role of the superficial fascia not only in thermoregulation and vascularization of the skin but also in relation to the lymphatic system and fat lobules.

The book presents an innovative way to treat lymphedema with clear rationale and guidelines to assess and restore lymphatic flow. An increase in superficial fascia stiffness could collapse the lymphatic vessels and the inflow and outflow of the lymph nodes. It is also interesting to consider the correlation between the immune and lymphatic systems and how they influence one another—requiring simultaneous assessment and treatment. The author emphasizes that this book seeks to help practitioners treat patients and guide them during the assessment process to better define treatment strategies for faster and long-lasting results.

The book combines all the information of levels I, II, and III for a more systemic approach to dysfunctions that require a full vision of the human body. I believe that this should be the goal of all healthcare practitioners working in rehabilitation. Too often, I have seen a localized approach that could not give the results expected. This global approach was also used in Luigi Stecco's Acupuncture: Western Medicine and Fascial Manipulation. He provides an essential overview of the relationship between cultures and reinforces a holistic, developmental approach to the body. My acupuncture experience allows me to understand better what Luigi means when he writes that fascia is "the connective tissue that connects Eastern and Western medicine." With Level IV, Practical Part: Fascial Manipulation, we can discuss how the internal systems (immune, thermoregulation, and metabolic) directly connect with the external systems (lymphatic, cutaneous, and adipocytes).

This work presents a brilliant clarification of the autonomic nerve system, underlying how the paravertebral ganglia, the 'primitive ganglia,' organize efferent and afferent neurons from the superficial fascia. In contrast, the prevertebral ganglia are like a 'second brain' that organizes these neurons from the hypothalamus to the organs. The para- and pre-vertebral ganglia interact to allow the body to self-regulate in relation to environmental changes.

It is fascinating how difficult pathologies, such as complex regional pain syndromes, can be easily understood and treated. A peripheral nerve is 80% autonomic fibers. Most of these fibers reach the superficial fascia and the skin to regulate and carry information. An increase in the stiffness of either the superficial or deep fascia can generate multiple nerve entrapments.

I invite all clinicians to read this book in order to learn how to diagnose and appreciate the fascia.

BRYAN O'YOUNG, MD
Professor and Vice-Chair of Education
Lewis Katz School of Medicine,
Chief of Outpatient PM&R Services
Temple University Health System,
Clinical Professor, NYU School of Medicine
Rusk Rehab at NYU Langone Medical Center
Adjunct Clinical Professor,
Weill Cornell Medical College
Chief Editor, PM&R Secrets, 4th Edition

Introduction

There are four types of fasciae in the human body. These fasciae are like labyrinths. You need Adriane's thread to navigate them or, in other words, you need to know their structural design exceptionally well.

- The superficial fascia is the most external fascia. It has always been considered as a "panniculus adiposus", with roles of energy storage and as a shock-absorber of external trauma. Many anatomists connect superficial fascia with the skin, calling it simply subcutaneous tissue: "The skin includes the epidermis, the dermis and the subcutaneous connective tissue or hypodermis" (Chiarugi G. 1975). The hypodermis is often called superficial fascia because it is formed by the retinacula cutis superficialis, which contain adipose lobules, the subcutaneous layer or true superficial fascia and the underlying retinacula cutis profundus, which contains interstitial loose connective tissue. Thickenings of the retinacula cutis that extend from the dermis to the deep fascia subdivide the superficial fascia into quadrants. In turn, each quadrant contains the elements of the three peripheral systems, meaning a dermatomere that is specific for exteroception, an adipotomere with abundant adipose tissue and a lymphatomere with its own lymphatic vessels. Together, the epidermis and dermis have an average thickness of two millimetres, whereas the hypodermis has an average thickness of around two centimetres. The quadrants of the superficial fascia maintain a certain continuity in the head and neck, upper limb, trunk and lower limb.
- The deep fascia is the second layer of fascia. For centuries it has been relegated to the role of restraining muscles, and in anatomy texts it is removed in order to highlight only the muscular tissue. Instead, the deep fascia is the peripheral assistant of the central nervous system. The brain programs a directional movement and then transmits the impulse to a specific segment of the body. Here the fascia intervenes to coordinate the muscle spindles of the unidirectional motor units and, thereby, forms a myofascial unit (mf unit). The deep muscular fascia synchronises the activity of all of the mf units arranged along a mf sequence. Furthermore, the fascia also activates the various tendon organs in succession during the passage from one plane to another.
- The internal fascia is the third layer. It surrounds the single organs, connecting them longitudinally to form the apparatus-fascial sequences, namely, the vascular, visceral, glandular and receptor sequences.

The vascular sequence begins its peristalsis when the embryonic heart starts to pump blood. With each heartbeat, blood enters the aorta and dilates the adventitia. This dilation stretches the intramural neuronal network, triggering a discharge that causes the smooth musculature of the vessel to contract. This process facilitates the distribution of blood, and it continues throughout the life of an individual.

The visceral sequence is activated in two phases: immediately after birth, with the first breath, and with the first breastfeed. Even though swallowing is a reflex action in newborns, it nevertheless involves the voluntary muscles that push the milk into the oesophagus, where stretch of the visceral fascia activates the neuronal network that determines the peristalsis of the entire digestive tract.

The glandular sequence begins working when a newborn enters into contact with the challenges of the external world. The first gland to activate is the thymus, aided by the bone marrow and the tonsils. Together with the thyroid and the parathyroids, these glands originate from the pharyngeal clefts and pouches. In the embryo, the septum transversum forms the capsules of all the glands, and it then accompanies each gland to its definitive site.

- The fourth fascia is that of the nervous system. It consists of the dura mater and two leptomeninges, namely the arachnoid mater (or arachnoid) and the pia mater. The dura mater is formed by two layers of dense connective tissue. The external or periosteal layer is adherent to the neurocranium or braincase, and the internal layer is in contact with the arachnoid. The pia mater is formed by loose connective tissue and it is in contact with the brain. The arachnoid is formed by a simple pavement epithelium that is included between the con-

nective tissue fasciae of the dura mater and the pia mater. The arachnoid contributes to the production of cerebrospinal fluid, which, once it has carried out its nutritional and metabolic role, is reabsorbed by the arachnoid granulations or villi located, above all, in the sagittal sinus.

Each fascia has its own specific innervation, as can be seen in studies by Schilder et al (2014) in which injections of hypertonic saline solution into the superficial fascia (subcutis) provoked localised pain, whereas an injection into the thoracolumbar fascia provoked a more diffuse, referred pain. In addition, these authors demonstrated that an injection into the deep fascia provoked sensations of burning and needle-like pain, typical of the innervation of A and C nociceptive fibres.

Innervation of the internal fasciae is provided by the autonomic nervous system:

- innervation of the three apparatus-fascial sequences is carried out by the metasympathetic autonomic nervous system, which is formed by the myenteric neuronal network and the small intramural ganglia within the mesenteries and the ligaments
- innervation of the three internal systems (immune, metabolic and thermoregulatory) is carried out by the macroscopic prevertebral ganglia, and the innervation of the three external autonomic systems (lymphatic, adipose and cutaneous) is carried out by the macroscopic paravertebral ganglia.

The external systems work in pairs with the internal systems: the cutaneous system mostly works with the thermoregulatory system, the lymphatic system with the immune system, and the adipose system with the metabolic system. In order to be utilised by the metabolic system, the adipose system has to have a semiliquid consistency: “The consistency or texture of fat depends on variations in the amount of lipids as the point of fusion varies. In order to be utilised, the fat has to be semiliquid, and this is determined by the amount of olein, which also diminishes the point of fusion” (Chiarugi G. 1975). This statement validates the usefulness of manipulation of the adipotomeres that have been found to be densified. In effect, friction creates heat and, as occurs with all connective tissues, this heat modifies the consistency of the ground substance of the adipose tissue.

Rather than being formed by specific organs, the internal systems of the body exploit the organs and apparatus that already exist. The prevertebral ganglia manage the functions of the apparatus-fascial sequences to the advantage of the internal systems, namely, the thermoregulatory, metabolic and immune systems. In turn, the prevertebral ganglia are controlled by the hypothalamus via the more recent fibres contained within the vagus, phrenic and splanchnic nerves.

The vagus nerve transmits parasympathetic stimuli for the metabolism of the visceral sequence. The phrenic nerve transmits adenosympathetic stimuli for the thermoregulatory reactions of the glandular sequence. The splanchnic nerves transmit orthosympathetic stimuli for the immune functions of the vascular sequence.

In order to reach the quadrants of the superficial fascia, the paravertebral ganglia connect to the peripheral nerves via the grey rami communicantes. In each quadrant, the cutaneous system forms the dermatomere, the adipose system forms the adipotomere and the lymphatic system forms the lymphatomere. We have chosen to use the term “dermatomere” rather than “dermatome” because dermatomere specifically indicates a portion of the skin innervated by a single sensory root of a spinal nerve, whereas dermatome is often used to indicate an instrument for cutting thin slices of skin. For uniformity, we use the term adipotomere to indicate the portion of adipose tissue of a quadrant and the term lymphatomere to indicate the group of lymphatic vessels within a quadrant.

Acknowledgements

I am particularly grateful to Dott. Nicola Piccin and all of his collaborators for their valuable editorial work.

Many thanks to my wife, Lena, for replacing me in so many commitments, allowing me to write this book.

Thanks to Dr. Caterina Fede for supplying the histological specimens of the superficial fascia.

Thanks to my colleague, Dennis Bertoldo, who offered to be the model for the numerous photographs.

Thanks to Dr. Warren Hammer, who edited the page of Fascial Manipulation published in Wikipedia: https://en.wikipedia.org/wiki/Fascial_Manipulation

Thanks to the Anatomy Institute of Padova University, directed by Prof. Raffaele De Caro, where a number of research projects regarding the fascia corporis have been carried out and subsequently published in various articles that are available through PubMed.

The Fascial Manipulation motto is: "Manus sapiens potens est" (A knowledgeable hand is powerful) or only the knowledge of anatomy and physiology of the fascia can provide optimal results. We could also say that "a therapist's hand can only become a powerful instrument for resolving many dysfunctions in the human body if it is supported by scientific knowledge, which replaces any lack of special intuitive talents".

Contents

Abbreviations ix
New terminology x

FIRST PART
ANATOMY AND PHYSIOLOGY OF THE SYSTEMS ... 1

Chapter 1
External and internal systems 3

Anatomy of the external systems and superficial fascia 4
Physiology of the external systems and paravertebral ganglia 13
Anatomy of the internal systems and autonomic nerves 20
Physiology of the internal systems and prevertebral ganglia 22
Grids for the external and internal systems 30

Chapter 2
Adipose and metabolic systems 37

Anatomy and physiology of the adipose system 38
Anatomy and physiology of the metabolic system 47

Chapter 3
Lymphatic and immune systems 55

Anatomy and physiology of the lymphatic system 56
Anatomy and physiology of the immune system 65

Chapter 4
Cutaneous and thermoregulatory systems . 73

Anatomy and physiology of the cutaneous system 74
Anatomy and physiology of the thermoregulatory system 83

Chapter 5
Psychogenic and central nervous systems .. 91

Anatomy and physiology of the psychogenic system 92
Somatotypes and different treatments 99
Anatomy and physiology of the central nervous system 100
Muscle spindles and centres of coordination ... 102
Golgi tendon organs and centres of fusion 110

SECOND PART
TREATMENT OF THE SYSTEMS 119

Chapter 6
Treatment of the adipose-metabolic system 121

Treatment of the adipose system 122
Adipotomeres in the head (caput) and neck (collum) 124
Adipotomeres in the trunk 132
Adipotomeres in the upper limb 140
Adipotomeres in the lower limb 148
Treatment of the metabolic system 156

Chapter 7
Treatment of the lymphatic-immune system 163

Treatment of the lymphatic system 164
Lymphatomeres in the head and neck 166
Lymphatomeres in the trunk 174
Lymphatomeres in the upper limb 178
Lymphatomeres in the lower limb 186
Treatment of the immune system 194

Capitolo 8
Treatment of the cutaneous-thermoregulatory system 201

Treatment of the cutaneous system 202
Dermatomeres in the head and neck 204
Dermatomeres in the trunk 212

Dermatomeres in the upper limb 220
Dermatomeres in the lower limb 228
Treatment of the thermoregulatory system 236

Chapter 9
Treatment of the psychogenic and central nervous systems 243

Treatment of the psychogenic system 244
Superficial fascia and dysfunctions of the external systems 246
Muscular fascia and locomotor apparatus pain 248
Internal fascia and dysfunctions of the apparatus-fascial sequences 250
Meningeal fascia and mental elaborations 252
Treatment of the central nervous system 256
Fascial neurorehabilitation 258
Rehabilitation of the trunk 263
Rehabilitation of the upper limb 270
Rehabilitation of the lower limb 277
Rehabilitation of chronic outcomes 284

Conclusion 293
References 295

Abbreviations

ACI	Circulatory apparatus
ACR	Chemoreceptor app. (taste-smell)
ADI	Digestive apparatus
AEN	Endocrine apparatus
a-f	Apparatus-fascial, internal sequence
AHE	Haematopoietic apparatus
AMR	Mechanoreceptor apparatus (hearing)
APR	Photoreceptor apparatus (sight)
ARE	Respiratory apparatus
A-re-la-	Retro-latero adipotomere of a segment
A-rt	Right sided adipotomere (lt = left sided)
AUN	Urinary apparatus
ca, di	Segments of carpus and digits (hand)
CC	Centre of coordination
CF	Centre of fusion
cp, cl, sc	Segments of head, collum and scapula
cx, ge	Segments of coxa (hip) and genu (knee)
D-an-me	Ante-medio dermatomere of a segment
DP	Deep point for the internal fasciae
D-rt	Right sided dermatomere (lt = left sided)
gl-cl	Glandular o-f unit in the collum (neck)
gl-lu	Glandular o-f unit in the lumbi
gl-pv	Glandular o-f unit in the pelvis
gl-th	Glandular o-f unit in the thorax
hu, cu	Segments of humerus and cubitus (elbow)
L-re-me-	Retro-medio lymphatomere of a segment
L-rt	Right sided lymphatomere (lt = left sided)
OB	Oblique tensors and catenaries
PNS	Peripheral Nervous System
q-an-la	Ante-latero quadrant of thorax, lumbar...
q-an-me	Ante-medio quadrant of thorax, lumbar…
SAM	Adipose Metabolic System
SCT	Cutaneous Thermoregulatory System
SE-GL	Glandular apparatus-fascial sequence
SE-RC	Receptor apparatus-fascial sequence
SE-VA	Vascular apparatus-fascial sequence
SLI	Lymphatic Immune System
SPS	Psychogenic System
ta, pe	Segments of talus and pes (foot)
th, lu, pv	Segments of thorax, lumbi and pelvis
va-cl	Vascular o-f unit in the collum (neck)
va-lu	Vascular o-f unit in the lumbi
va-pv	Vascular o-f unit in the pelvis
vi-cp	Visceral o-f unit in the head
vi-lu	Visceral o-f unit in the lumbi

New terminology

Adenosympathetic	Autonomic component connected to the functions of the glandular a-f sequence and stimulated directly by the phrenic nerve and derived plexuses
Adipotomere	Quadrant of adipose tissue included between the dermis and the deep fascia; its boundaries are formed by thickenings of the superficial fascia
Attractor Points	Area of a superficial fascia quadrant that palpation verification has identified as having reduced sliding, less elastic and more sensitive
Catenaries in the trunk	Lines that correspond to areas where the fasciae of the muscles that cover the anterior and posterior trunk fuse together
Compression of DP	Manoeuvre of deep manipulation (DP) to carry out in the abdominal and cervical walls to reach the internal fasciae that were identified as sensitive
Control catenaries in the head	Lines in continuity with the trunk catenaries that, being in contact with the receptor apparatus, have a control function over the entire body
Dermatomere	Quadrant of the dermis and epidermis innervated by a specific cutaneous nerve for exteroception, or the perception of touch, cold and heat
Diagonal	Corresponds to the intermediate line between two myofascial sequences; hence, it manages the passage of a limb from one plane to another
Distal points	Centres of fusion located near the retinacula of the carpus and talus that are used during palpation verification of the four tensors
External systems	Adipose, lymphatic and cutaneous systems connected with the superficial fascia (hypodermis) and coordinated by paravertebral ganglia via peripheral nerves
Fasciatomere	Sector of the deep fascia containing nerve endings that are responsible for proprioception or the perception of movement in a particular direction
Internal systems	Metabolic, immune and thermoregulatory systems, coordinated by the hypothalamus via the vagus, phrenic and splanchnic nerves that insert into the prevertebral ganglia
Lymphatomere	Part of a quadrant containing the lymph, lymphatic channels, lymphangions and lymph nodes; it differs from the angiotome that also contains the blood vessels

Node points	Centres of fusion located near the xyphoid process, umbilicus, pubis and eighth thoracic vertebra, all areas where multiple tensions converge
Organ-fascial unit	Organs, fasciae and extramural ganglia included in a segment of the trunk that, together, carry out a visceral, vascular or glandular function
Orthosympathetic	Autonomic component connected with the functions of the vascular a-f sequence; supplied by the splanchnic nerves and the prevertebral ganglia
Parasympathetic	Autonomic component connected with the functions of the visceral a-f sequence and the stimuli conducted by the two vagus nerves
Pivot points	Centres of fusion (CF) located in the areas of transition between the trunk and the extremities; they correspond to the neck and the shoulder and pelvic girdles
Proximal points	Secondary points of each tensile structure and catenary; they are palpated in a second step to test whether they are densified
Quadrant	Subdivision of the superficial fascia into four parts for every segment of the body; it includes a dermatomere, a lymphatomere and an adipotomere
Sequence, apparatus-fascial	Internal fasciae that have preferential relationships with the vessels (mesoderm), viscera (endoderm), glands (transderm) and nerves (ectoderm)
Transderm	Fasciae derived from the transverse septum during the embryonic phase that is connected with the glands of the endocrine and haematopoietic apparatus