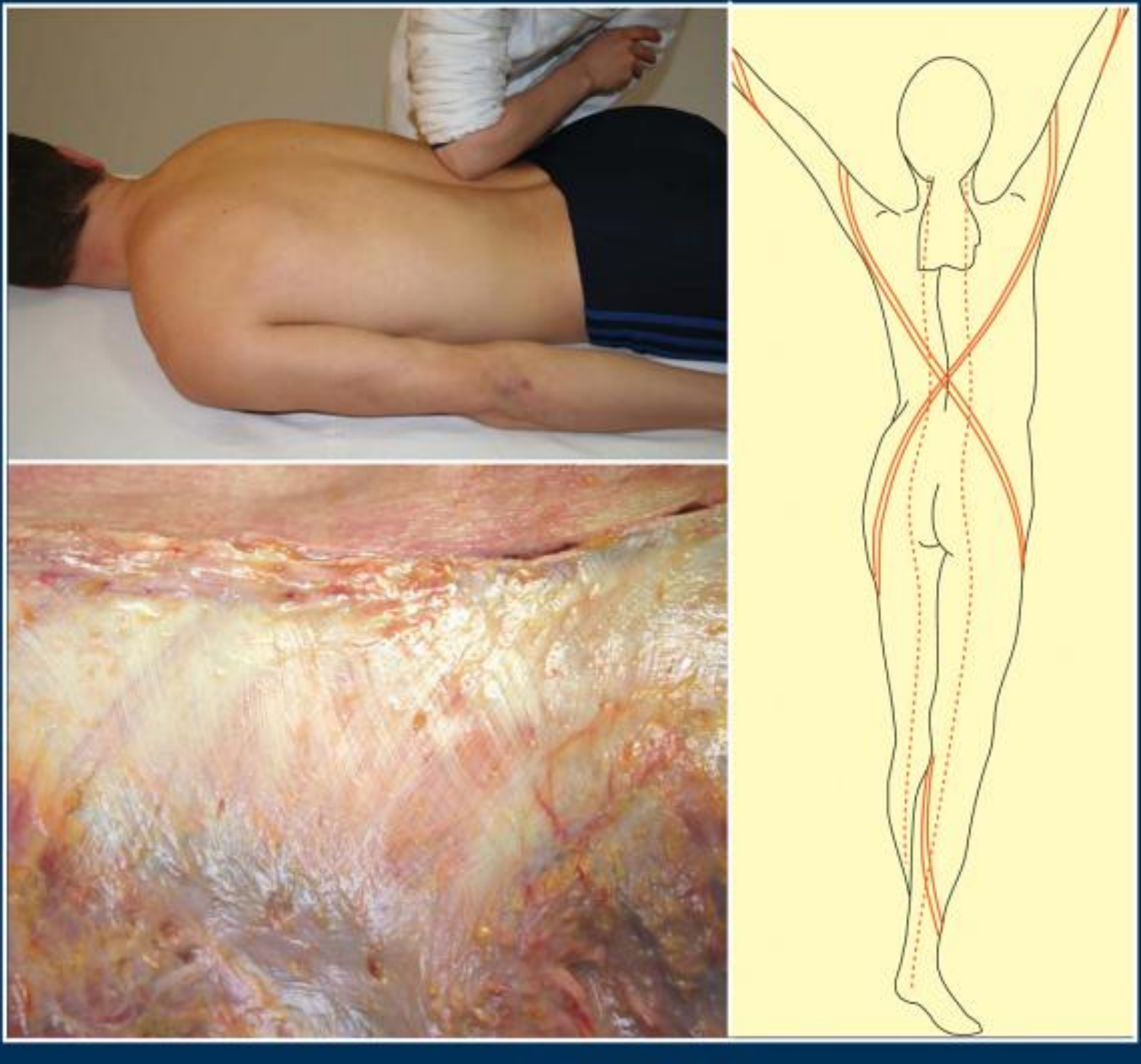
LUIGI STECCO - CARLA STECCO

FASCIAL MANIPULATION

PRACTICAL PART

Foreword by
ROBERT SCHLEIP



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GENERAL INDEX

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INTRODUCTION

The intention of this manual is to provide a practical tool for therapists, or fascial therapists, who utilise fascial manipulation in the treatment of myofascial (mf) pain.

Divided into two parts, the first section of this book examines the treatment of the Centres of Coordination (CC) of each mf unit, and the second section deals with the treatment of the Centres of Fusion (CF).

An introductory chapter illustrates the basic principles of anatomy and histology of the fasciae (superficial, deep and epimysial). A clear understanding of the composition and the localisation of these tissues is essential in order to be able to treat them effectively.

The **first section** of this book presents the mf units, which move the various body segments in the three spatial planes. Six mf units coordinate each articulation: namely, the mf units of antemotion, retromotion, lateromotion, mediomotion, intrarotation, and extrarotation. Each mf unit has a Centre of Perception (CP), which corresponds to the area where a patient feels, or perceives, their pain and a Centre of Coordination (CC), which corresponds to the origin of the dysfunction.

The site of pain, or CP, is normally located around an articulation. Each mf unit governs a particular area of an articulation, therefore, accurate movement verifications can identify the mf unit responsible for any given joint pain, or dysfunction.

These movement verifications are not individual muscle tests. They evaluate the overall performance of the bone-nerve-myofascial complex, or myofascial unit, as it moves a segment in a specific direction.

After experiencing Fascial Manipulation, many patients remark, "this is not a massage!" In effect, it involves deep pressure over specific areas (CC), necessary for identifying fascial alterations. Having isolated a fascial alteration, manipulation is performed for several minutes until the pain disappears. Each CC is located at a distance from its relative CP and is painful only on palpation.

The **second section** of this book examines motor schemes comprised within complex movements. In this case, Centres of Fusion (CF) located within the retinacula, fascial structures surrounding the joints, coordinate two or three mf units. Centres of Fusion (CF) generally extend over a wider area than the CC(s), so they are often composed of two or three sub-units that have proven to be of significant therapeutic effect. To facilitate fascial therapists, these sub-units are numbered accordingly: 1, 2, or 3. Retinacula consist in the fusion of numerous layers of collagen fibres, therefore these points necessitate a "mobilisation" of the collagen layers rather than a deep, penetrating manipulation.

Segmental CC(s) are united in myofascial sequences or myokinetic chains. Likewise, the CF(s) are united in myofascial diagonals and spirals.

Anatomical photographs of the fasciae introduce each mf sequence and mf diagonal. While photographs of the fasciae are apparently less precise than anatomical drawings of each muscle, fascial therapists need to focus their attention on this lesser known tissue rather than on muscles. In effect, each mf unit consists of muscle fibres located within several different muscles and the fascia that unites them together.

Synoptic tables that summarise all of the points and all the movement verifications can be found in the final part of this book.

SAPIENS POTENS MANUS EST

The Fascial Manipulation Logo

BASIC PRINCIPLES

The term "fascia" is often used for connective tissue formations that are structurally quite different from one another, with significant functional diversities. We therefore need to define our understanding of superficial fascia, deep fascia, and epimysial fascia.

These connective tissue formations are arranged in layers (Fig. 1). If we examine them layer by layer, from the external to the internal layer in the trunk region, we find:

1. the skin, formed by the epidermis and dermis;
2. the superficial layer of the hypodermis, consisting in loose connective tissue, rich in adipose cells, and intersected by the superficial retinaculum cutis;
3. the superficial fascia (membranous layer), formed by collagen and elastic fibres;
4. the deep layer of the hypodermis, consisting in loose connective tissue and the deep retinaculum cutis;
5. the deep fascia, that envelops the large muscles of the trunk and the aponeurotic fibres of the limbs;
6. the epimysial fascia, which lies beneath the deep fascia in the limbs;
7. the rib cage, the pelvis and, within them, their respective visceral fasciae.

As we will see further on, the organisation of the deep fascia in the limbs is quite different from that of the trunk.

Prior to examining the superficial fascia in detail, the different biological tissues with which one interacts during Fascial Manipulation are now considered.

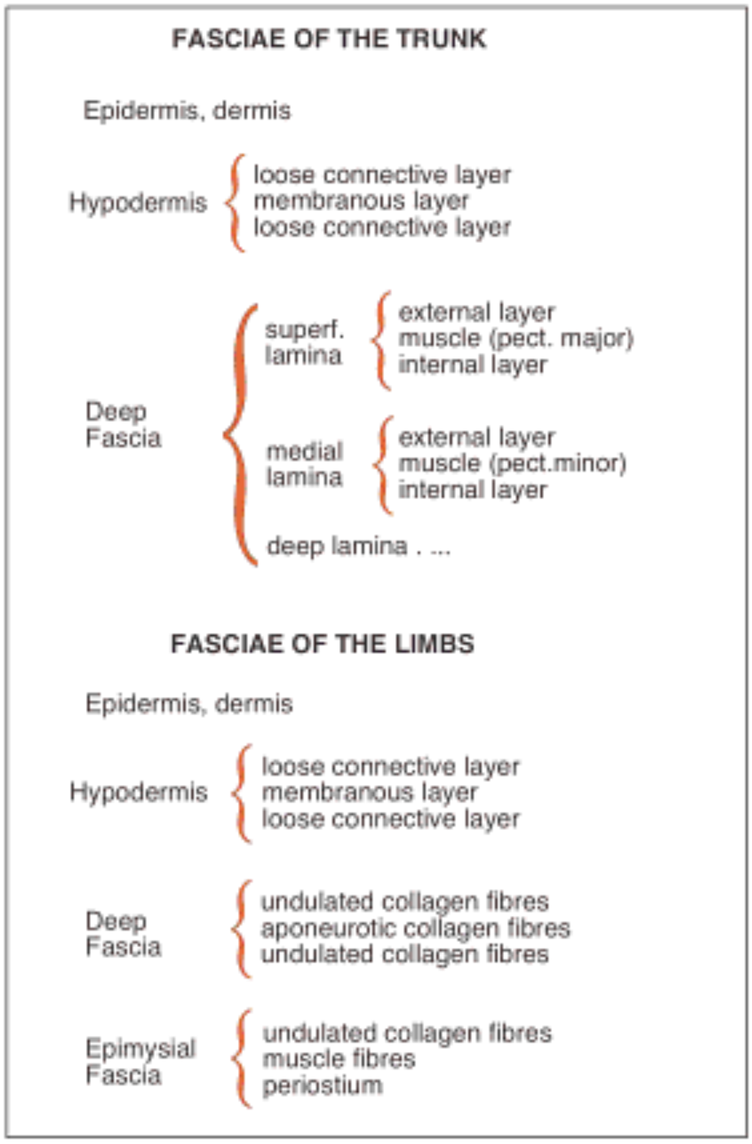

Fig. 1. Macroscopic subdivision of the fasciae.

The tissues

True ***connective tissue*** comprises so-called loose and dense connective tissue.

Loose connective tissue is found in abundance beneath the skin layer (hypodermis or subcutaneous connective tissue, rich in adipose cells) and in the spaces between muscles. It also forms the lamina propria, sustaining the epithelium of the mucosa and the membranes that line the hollow organs.

Dense connective tissues can be divided into regular or irregular, according to the arrangement of their collagen fibres[1]. In the first case, the collagen

[1] Connective tissue consists of three types: dense regular, dense irregular, and loose irregular. Dense irregular is found in fascial sheaths, aponeuroses etc; loose irregular is found in the superficial and deep fascia, in the endomysium, in muscular sheaths etc. Loose connective tissue mostly forms the fascia. (Hertling D, 2005)

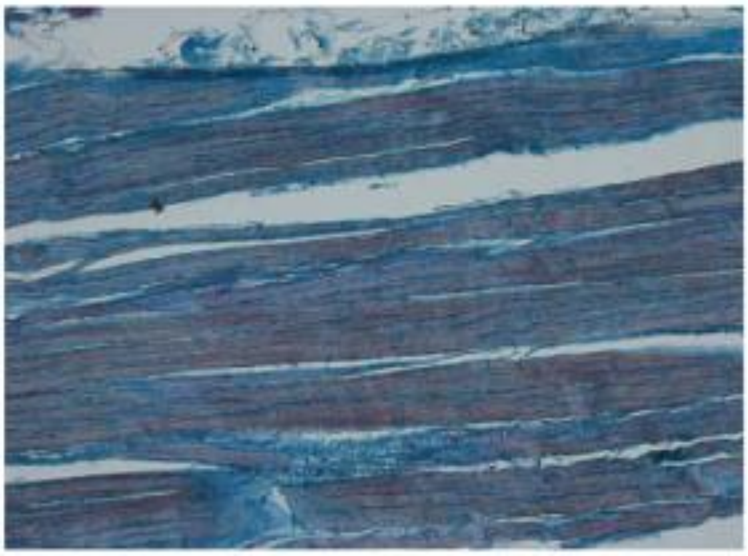

Fig. 2. Collagen fibres of the lacertus fibrosus (50x, Azan-Mallory).

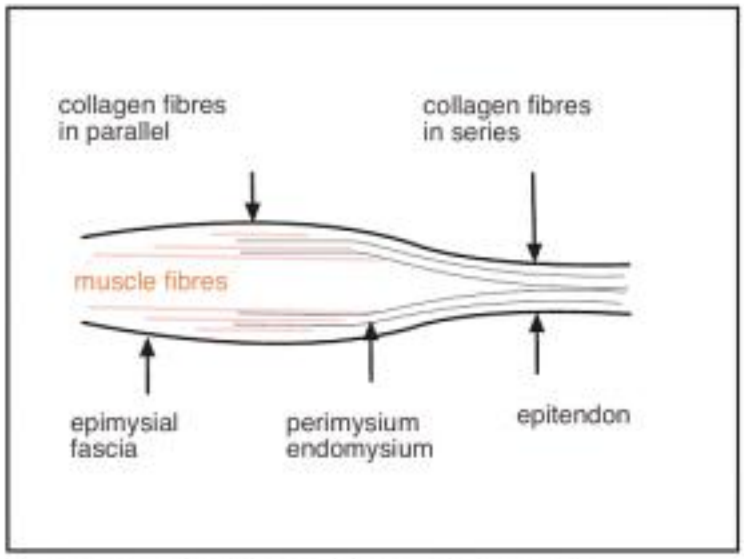

Fig. 4. Connective tissue skeleton of all muscles.

fibre bundles are parallel, close packed and inextensible. Their function, as seen in tendons and aponeuroses, is to transmit muscular force (Fig. 2).

In the second case, the collagen fibre bundles have a less orderly arrangement. Two particular types are identifiable:

- multilayer, parallel collagen fibres; in each layer fibres are aligned in different directions, as found in retinacula and within deep fascia of the limbs.
- undulated collagen fibres (Fig. 3), as found in the epimysial fasciae of the trunk and the limbs; their undulating conformation allows them to be lengthened, activating embedded neuroreceptors.

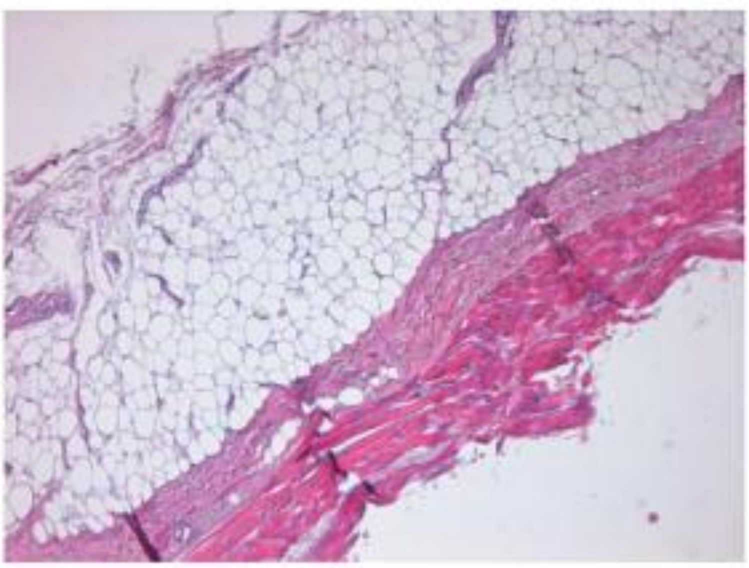

Fig. 3. Undulated fascial fibres between adipose cells and muscular fibres of quadriceps (25x, Hematoxylin-Eosin).

Muscular tissue is responsible for voluntary and involuntary movements of organs and the various apparatuses. There are three categories of muscle tissue: striated skeletal, striated cardiac and smooth muscle tissue. Bundles of associated muscle fibres, united by connective tissue[2], form all skeletal muscles, providing muscle with a connective tissue skeleton (Fig. 4). Via this "skeleton", the muscular fibres transmit their contractile force to bone.

In fact, in each muscle we find collagen fibres in parallel with muscle fibres (epimysial fascia, perimysium, and endomysium), as well as collagen fibres in series with muscle fibres (epitendon and tendinous fibres). The epitendon is the continuation of the epimysial fascia; the tendinous fibres are the transformation of the undulated collagen fibres of the perimysium into parallel, inextensible collagen fibres.

Nervous tissue is formed by two types of cells: neurones, cells specialised in receiving and transmitting nerve impulses, and neuroglia or glial cells. The latter provide important functional support for neurones. There is also a connective tissue stroma, essential for nervous tissue survival[3].

[2] A dense connective tissue sheath, the epimysium, surrounds each muscle in the body. This sheath inserts onto bone via the tendon, with which it is continuous. Septa of interstitial connective tissue extend from the epimysium and surround muscle fibre bundles forming the perimysium. Lastly, the endomysium, consisting in a basal membrane and a thin web of reticular fibres, surrounds each single muscle fibre. (Adamo S, 2006)

[3] A nerve is an anatomical structure encased in a dense connective tissue sheath (epineurium) from which connective tissue offshoots (perineurium) extend, dividing the internal part of the nerve into compartments. Laminae of reticular connective tissue extend from the perineurium to surround each single nerve fibre (endoneurium). (Adamo S., 2006)

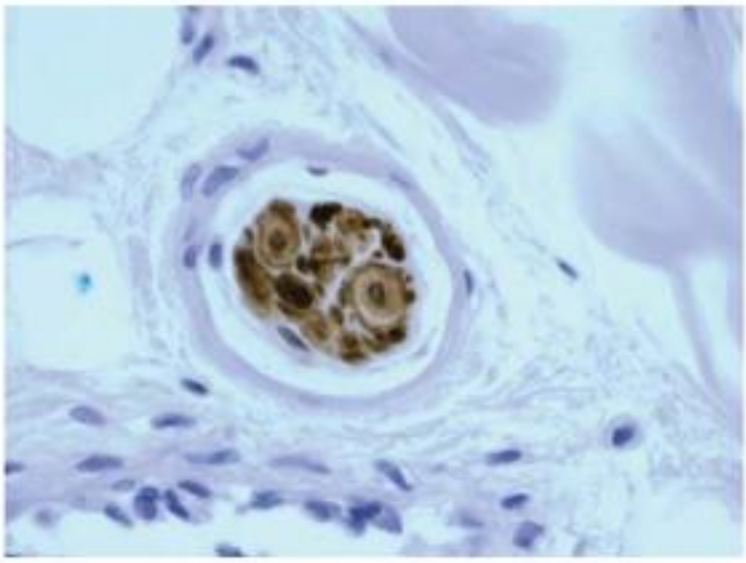

Fig. 5. A nerve within the fascia (250x, immunohistochemical S100).

The histological specimen in Fig. 5 demonstrates a sectioned nerve as it passes through the brachial fascia; the fascia forms an insulating sheath, protecting the nerve from any deformation. However, when the nerve terminates at its designated receptor, numerous fascial collagen fibres unite with either the nerve capsule or the free nerve ending, depending on the type of receptor. This ensures stretch of the receptor during movement.

Superficial fascia

We will now present the description of the superficial fascia as proposed by the majority of anatomists (including Fazzari, Testut, and Gray).

The subcutaneous layer, or hypodermis, can be divided into three layers (Fig. 6): superficial, intermediate or superficial fascia, and deep. In the superficial layer, bundles of collagen fibres, also known as cutaneous ligaments, extend from the dermis to the intermediate layer. These transverse septa shape cavities containing adipose lobules (panniculus adiposus). Together these ligaments, or transverse septa, form the retinaculum cutis superficialis[4].

The fibres of the intermediate, or membranous layer, are aligned parallel to the skin, such as to form a true lamellar fascia (superficial fascia).

The deep layer of the hypodermis is very thin and consists of loose connective tissue. Also at this level, connective tissue septa connect the superficial fascia to the deep fascia, forming the retinaculum cutis profundus. Here the sparsely distributed septa are thinner and more oblique as compared to those of the retinaculum cutis superficialis.

In some particular regions of the body (e.g. cranium, neck), striated muscle fibres have developed within split layers of superficial fascia itself (superficial musculoaponeurotic system or panniculus carnosus). Double or split layers of superficial fascia also enclose subcutaneous vessels and many nerves.

For some authors (Marquart C.,Varnaison E. 2001), the hypodermis[5] and the superficial fascia are to be considered as an integral part of the skin. These authors remark that, by pinching the skin, it is evident that the hypodermis is continuous with the dermis and that it slides over the muscular fascia thanks to a thin, deeper layer.

Other authors describe yet different versions of the superficial fascia of the face (parotid gland region, temporal region[6], etc).

During dissections, once the skin is removed, we find the subcutaneous tissue, rich in adipose cells (Fig. 8). Histological studies of the subcutaneous loose connective tissue[7] evidence nerve fibres, nu-

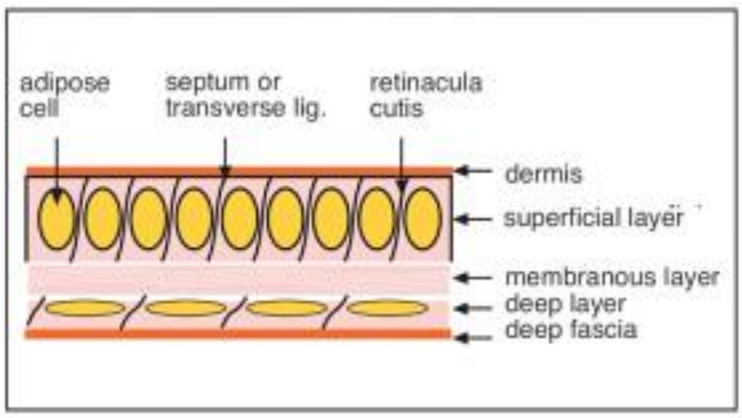

Fig. 6. Diagram of the subcutaneous loose connective tissue, transverse section.

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[4] The cutaneous ligaments (retinacula cutis) anchor the skin to the deep fascia. They are abundant in the face, palms of the hand, soles of the feet and in breast tissue. (Nash L.G. 2004)

[5] The skin comprises the epidermis, the dermis, and the hypodermis; the hypodermis cannot be considered as a separate subcutaneous tissue. In the deeper part of the hypodermis, an apparently lamellar area, in continuity with the interlobular septa, is often present and it is difficult to separate from the hypodermis. This region corresponds to a plane of gliding, as do all layers of loose connective tissue. The lamellar layer of the hypodermis was initially named "superficial fascia", but anatomists have now excluded this term. (Marquart-Elabz, 2001)

[6] On the basis of our observations on the parotid gland, no parotid fascia as such seems to be present, but rather a superficial thickening of the connective tissue with muscle fibres, which can be identified as the superficial fascia together with the platysma. This implies abandoning the expression introduced by Mitz who defines this structure as representing a "superficial musculoaponeurotic system" (SMAS),which, in fact, can be considered to correspond to the superficial fascia. (Zigiotti G.L., 1991)

[7] The subcutaneous connective tissue was observed to be composed of multiple layers of thin collagen sheets containing elastic fibers. Those piled-up collagen sheets were loosely interconnected with each other, while outer and inner sheets were respectively anchored to the dermis and epimysium by elastic fibers. (Kawamata S.,2003)

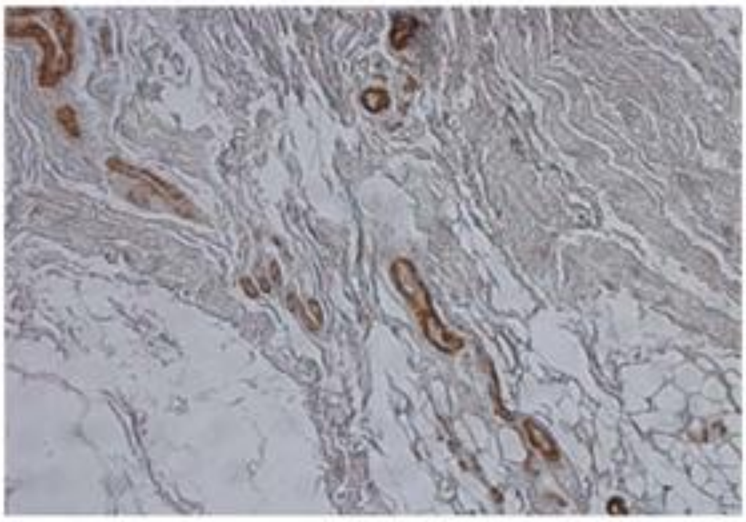

Fig. 7. Superficial fascia of the forearm (50x, immunohistochemical S100).

Fig. 8. Subcutaneous tissue of the posterior region of the lower leg, rich in adipose cells.

merous adipose cells (Fig. 7) and a mesh of collagen and elastic fibres. This tissue presents a different thickness in the various regions of the body, and this thickness also varies considerably from one subject to another. This loose connective tissue layer is only present in animals that have developed thermoregulation (homeothermy). Furthermore, in furry animals (e.g. rabbits), it is particularly thin, whereas in animals with very little fur (e.g. pigs) it is more than abundant.

In humans, this adipose layer is absent in the lips, eyelids, penis and scrotum.

Having removed the adipose tissue by dissection, the superficial fascia is then visible (Fig. 9). It presents as an extremely elastic membrane, rich in blood vessels.

Within certain limits, this membranous layer glides over the deep fascia. Two specific factors enhance this ability to glide: a thin, intervening layer of loose connective tissue and the oblique alignment of the fibrous septa of the retinaculum cutis profundus.

Along the linea alba, the supraspinous ligaments, and the inguinal ligament, the deep cutaneous retinaculum unites the superficial to the deep fascia in a robust manner.

According to the various body regions, superficial fascia has different regional characteristics:

- in the abdomen it is bilaminated, taking the name of Camper's fascia (more superficial and loose) and Scarpa's fascia (deeper and more membranous);
- in the pelvis it forms the superficial fascia of the perineum (Colles' fascia) that attaches to the borders of the urogenital diaphragm;
- in the cranium, it forms the galea aponeurotica, stretched between the frontalis and occipitalis portions of the occipitofrontalis muscle and the superficial musculoaponeurotic system (SMAS);
- in the palms of the hands and soles of the feet, the collagen fibres connecting the skin to deep fascia are more numerous, in order to impede gliding. This allows for a solid grip or foothold.

We find the same arrangement of tissue layers mirrored in the internal wall of the trunk[8]: the serous membrane is in contact with the visceral organs (parietal peritoneum). In the next layer, we find the subserosal connective tissue, and in the last layer, the transversalis fascia, and the internal intercostal muscle.

[8] For a fuller understanding of the fascial relationships of the visceral organs and their vessels, a general scheme is presented: in the abdomen, the internal layers consist of the peritoneum, the deep layer of the subperitoneal fascia, the superficial layer of the subperitoneal fascia and the transversalis fascia. The external layers comprise the skin, the superficial layer of the subcutaneous fascia, the deep layer of the subcutaneous fascia and the investing layer of the abdominal fascia. (Sato T., 1984)

Fig. 9. Superficial fascia of the lower leg (with adipose cells removed), sectioned, and retracted, to highlight underlying deep fascia.

The subserosal membrane is absent between the internal intercostal muscle and the parietal pleura, whereas it duplicates in the retroperitoneal region to surround the kidneys, the ureters and the bladder.

Deep fascia

The deep fascia lies beneath the superficial fascia. Its external surface extends throughout the whole body in a uniform manner, while its internal surface connects to underlying muscles. This intimate connection between deep fascia and muscles differs considerably between the trunk and the limbs

Deep fascia of the trunk

Comparative anatomy texts describe how the extrinsic muscles of the trunk originate from the fascia that covers the epiaxial myomeres (Kent G. 1997). For this reason, the large muscles of the trunk (latissimus dorsi, pectoralis major, gluteus maximus etc.) have developed within a doubled or bilaminated layer of the deep fascia. Consequently, in the trunk, these deep fascia laminae are inseparable from the epimysium[9] of the individual muscles.

Testut, Chiarugi, and Gray describe the large trunk muscles as being comprised within a doubled layer of fascia[10].

Therefore, we can say that the deep fascia of the trunk is subdivided into three laminae (Fig. 10) and that each lamina is, in turn, bilaminated in order to accommodate the various muscles:

- superficial lamina: in the neck, the superficial lamina encloses sternocleidomastoid and trapezius; it then forms the pectoralis fascia, the latissimus dorsi fascia, and gluteus maximus fascia;
- middle lamina: the middle lamina of the cervical fascia encloses the omohyoid muscle, and then forms the serrati fascia, and the fascia of the oblique muscles;
- deep lamina: the deep lamina of the cervical fascia encloses prevertebral and paravertebral muscles, to then form the fascia of the erector spinae, the rectus abdominis fascia, and the iliopsoas fascia.

In humans, there are no muscles within the superficial lamina of the abdominal deep fascia[11] because during the evolutionary process they have atrophied[12].

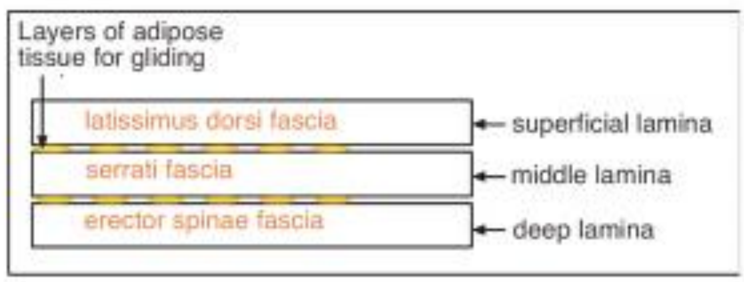

Fig. 10. Subdivision of the deep fascia of the trunk.

[9] We assert that transversalis fascia is the inner epimysium of transversus abdominis muscle; no separate deep investing fascia exists. (Skandalakis P.N., 2006)

The deep fascia corresponds to the epimysium of some muscles. (Gray H., 1993)

[10] The pectoralis fascia is a thin lamina that covers the pectoralis major and extends septa between its muscular bundles. Inferiorly, it continues with the shoulder, axilla, and thorax fasciae. It is very thin over the pectoralis major but it thickens in the space between this muscle and latissimus dorsi, crossing over this latter muscle as the axillary fascia; the axillary fascia doubles itself into two lamina at the lateral margin of latissimus dorsi to include this muscle. (Gray H. 1993)

[11] Rizk noted that the external oblique is bi-laminar, with an external layer and a deep layer. The deep layer is continuous with the fibre bundles of the contralateral internal oblique's aponeurosis; the superficial layer has S-shaped fibres that insert into the abdominal fascia. (Gray H., 1993)

[12] In amniotes, lateral musculature (obliques-transversus) of the thoracic region is complicated by the presence of the ribs (absent in amphibians), whereas it is present in the abdomen. The external oblique is bi-laminated into a superficial and a deep layer. The superficial layer of the external obliques becomes the internal intercostal muscles and the deep layer the external intercostal muscles. (Stefanelli A. 1968)

A thin layer of connective adipose separates the various laminae of the trunk's deep fascia from one another, allowing for gliding to occur between layers. Some authors have inappropriately called these thin adipose layers, "thin fascia"[13]. Numerous septa unite the trunk fasciae to the underlying muscles[14]. When these muscles contract they tension the fasciae, activating the neuroreceptors embedded within the fascia. This could be the basis of proprioception.

The fasciae of the large muscles of the trunk enclose the aponeuroses in the same way that the epitendon encloses the tendons of the limbs[15].

During anatomical dissections, we found a thin lamina of connective tissue laying over the latissimus dorsi and continuing over the aponeurosis (Fig. 11). In effect, the collagen fibres of the latissimus dorsi's aponeurosis are clearly visible beneath this layer. These aponeurotic fibres are parallel, inextensible, and ipsidirectional, just like the fibres of other tendons designated to the transmission of force. Histological studies[16] also confirm that the thoracolumbar fascia has a layered formation; the more superficial layer, or the external lamina of the latissimus dorsi, lies over the aponeurosis of the same muscle.

The so-called thoracolumbar fascia is actually a system of fasciae and aponeuroses (Fig. 12). It is comprised of numerous layers of aponeuroses and fasciae, originating from several different muscles. Starting from the more external layer, we find the epimysial fascia of latissimus dorsi, which, once the muscle fibres terminate, continues with the same muscle's aponeurotic collagen fibres. In part, these collagen fibres insert onto the spinous processes of the lumbar vertebrae. In part, they cross to the opposite side of the body, providing insertions for numerous gluteus maximus' muscle fibres. In the next layer, we find that the epimysial fascia of the internal oblique muscle continues with the aponeurosis of this same muscle, terminating where internal oblique inserts onto the spinous process. Longitudinally, within this compartment formed by these two fasciae-aponeurotic structures, lies the muscle group of erector spinae. Via its own fascia-aponeurosis, the erector spinae fuses with the previous two only at the sacrum level. The fascia-aponeurosis of the transversus abdominis muscle inserts onto the transverse processes, forming the inferior boundary of the erector spinae compartment.

Fig. 11. Detail of thoracolumbar fascia over the latissimus dorsi; note the aponeurotic fibres arranged according to the directions of traction.

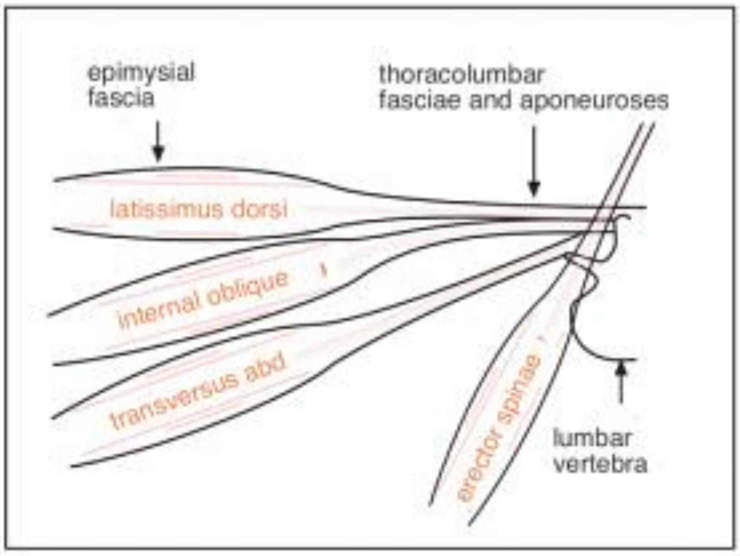

Fig. 12. Diagram illustrating conformation of thoracolumbar fascia.

[13] The external oblique muscle of the abdomen is covered by both subcutaneous tissue and thin fascia or investing aponeurosis that continues onto its insertional aponeurosis, or laminar tendon. A second connective tissue lamina lies between the external oblique and the internal oblique muscles. A third connective tissue lamina is found between the internal oblique muscle and the transversus muscle. All of these fasciae are extremely thin and of little importance (Chiarugi G.)

The nerves and vessels pass beneath the gluteus maximus within the deep gluteal fascia, an intermuscular plane, rich in adipose tissue and structured in such a way that its external surface is more rigid than its internal surface. (Lang J. 1988)

[14] The intimate relationship between trapezius and its investing fascia is rarely considered. In fact, many fibres of the muscle itself insert onto the internal surface of the deep fascia of trapezius. (Hertling D., 2005)

[15] The peritendon, which contains elastic and collagen fibres, continues, superficially, with the surrounding connective tissue and, deeply, with the endotendon that occupies the spaces between the tendinous bundles. (Gray H., 1993)

[16] The superficial lamina of the posterior layer of the thoracolumbar fascia continues with the latissimus dorsi, gluteus maximus and, partially, with the external oblique muscle and trapezius. At the L5 level and at the sacrum a strong connection exists between the superficial and deep laminae of the thoracolumbar fascia. The tranversus abdominus and the internal oblique muscles are indirectly attached to the thoracolumbar fascia via a raphe formed from the fusion of the middle layer to the deep layer of the same fascia. (Vleeming A., 1995)

The fact that part of the latissimus dorsi collagen fibres do not insert onto the spinous processes is extremely important. As already mentioned, they continue into the opposite side of the body, providing insertions for some gluteus maximus muscle fibres. This collagen fibre "bridge", between latissimus dorsi on one side and gluteus maximus on the opposite side, coordinates motor activity between an upper limb and its contralateral lower limb[17]. While these collagen fibres do not transmit muscular contractile force to bone, as most tendons do, their role is to synchronise the activity of two synergic muscles. This activity of peripheral motor coordination is typical of the fascia.

Hence, the term "muscular fascia" comprises not only the thin, epimysial fascia layer, but also those aponeurotic portions that unite different muscles together and do not insert onto bone[18].

In the trunk, collagen fibre bridges between synergic muscles often constitute a definite continuity. The aponeurotic continuity between external oblique on one side and the contralateral internal oblique in the abdomen is one example, as are the right and left portions of the trapezius muscle in the cervicodorsal region.

Deep fascia of the limbs

Rather than enveloping muscles that have developed within its split layers, deep fascia in limbs, as compared to that of the trunk, glides over muscles. In fact, limb fascia is the continuation of the bilaminated epimysial fascia of large trunk muscles.

Collagen fibre bridges, which in the trunk unite synergic muscles, in the limbs extend within the deep fascia itself.

On histological analysis (Fig. 13), limb fascia appears to be formed by a series of parallel and inextensible collagen fibres that transmit muscular force[19], as well as undulated collagen fibres that are sensitive to stretch and can activate embedded receptors. Only these extensible structures can ensure activation of neuroreceptors.

For example, two layers of the deep fascia (epimysium) of gluteus maximus, gluteus medius, and tensor fascia latae muscles (Fig. 14), form the fascia lata.

Furthermore, between these two layers of the fascia lata extend collagen fibres that originate from the aponeuroses of these abovementioned muscles. The distal tendon, or distal aponeurosis, of gluteus maximus, for example, splits in two, one part inserting onto the femur and the other terminating within the fascia lata itself[20] (an aponeurosis with a fascial insertion).

Hence, various muscles contribute to the formation of the fascia lata in the posterior region of the thigh (Fig. 15). Collagen fibres originating from gluteus medius and minimus are on a more superficial plane and they project medially, contributing to the "cavezza" or halter-like formation known as the suspensory retinaculum of gluteus maximus[21]. The glu-

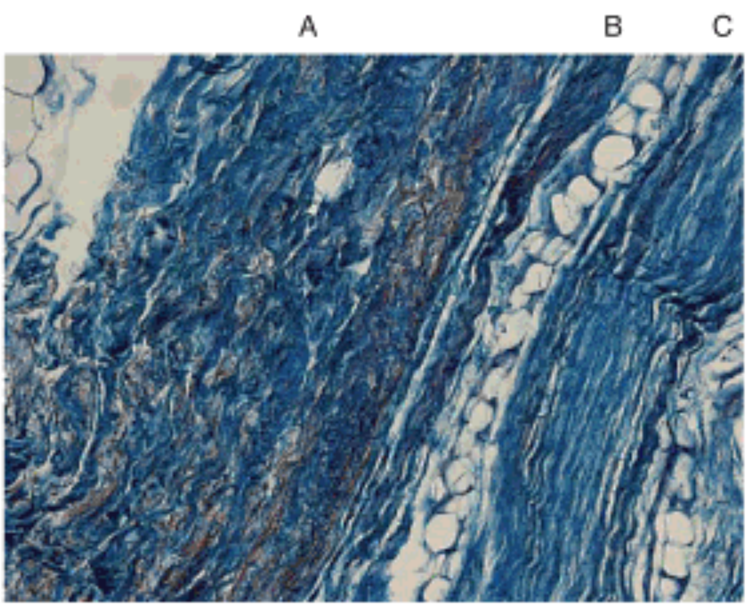

Fig. 13. Antebrachial fascia (100x, Azan-Mallory); A, undulated collagen fibres; B, adipose layer for gliding; C, inextensible collagen fibres.

[17] Histological examination of the posterior layer of the thoracolumbar fascia demonstrates that the number of laminae varies according to the spinal level:at L1 level there are two laminae, three at L3-5 level and five laminae at the sacrum level. The latissimus dorsi aponeurosis is the chief component of this fascial layer. The fibres of the superficial lamina crossover the mid-line, joining with the lamina on the opposite side. At L4-L5 level, the supraspinous ligament is absent. The posterior layer of the thoracolumbar fascia supports movements on the sagittal plane, whereas the middle layer contributes to stability on the coronal and sagittal planes. (Tesh K.M., 1986)

[18] Other authors have described the dorsolumbar muscles as being covered by two layers of fascia. The external layer has been named the dorsal layer of the lumbodorsal fascia or superficial lumbodorsal fascia (Crouch). In the cat, this fascia fuses with the aponeurosis of the erector spinae at the sacrum level and, near the iliac crest, gives attachment to part of the sartorius muscle. The aponeurosis of the erector spinae lies beneath this layer of fascia. Reighard named this the deep layer of the lumbodorsal fascia. Even though this layer, in part, glides freely muscles like a fascia, we consider it is an aponeurosis due to the fact that it gives insertions to many muscles. (Bogduk N. 1998)

[19] Surprisingly, most material parameters for the two layers of the fascia lata did not differ significantly from corresponding values for the isolated tendons and tendon-bone preparations. (Butler D.L., 1984)

[20] The fascia lata, or femoral, is reinforced laterally by a certain number of aponeurotic expansions from the gluteus maximus fascia and the tensor fascia lata muscles. (Testut L. 1987)

[21] The halter system. Distally, from the line that connects the ischial tuberosity to the apex of the greater trochanter, the transverse bundles of the fascia lata project towards the skin and the underlying musculoskeletal plane. Thanks to the presence of a rigid system of "retinacula" these bundles limit the subcutaneous connective tissue, circumscribing the distal margin of the gluteus maximus in a halter-like formation. (Lang J, 1988)

Fig. 14. Connection of the deep fascia of gluteus medius and maximus to the fascia lata. Removal of the superficial fascia in the trunk reveals the epimysial fascia of gluteus maximus, whereas in the lower limb the deep fascia (fascia lata) is visible.

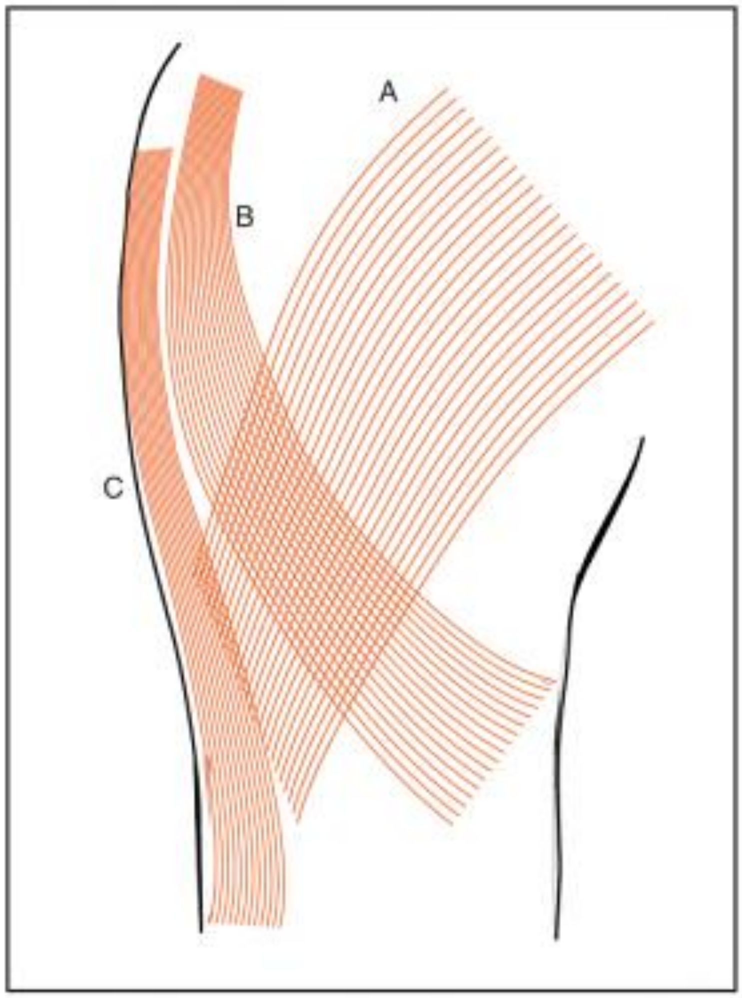

Fig. 15. Arrangement of endofascial collagen fibres in deep layer of the upper thigh: A, collagen fibres originating from gluteus maximus. Distally they pass beneath those of the gluteus medius; B, collagen fibres from the gluteus medius; C, collagen fibres from the tensor fascia lata and gluteus minimus.

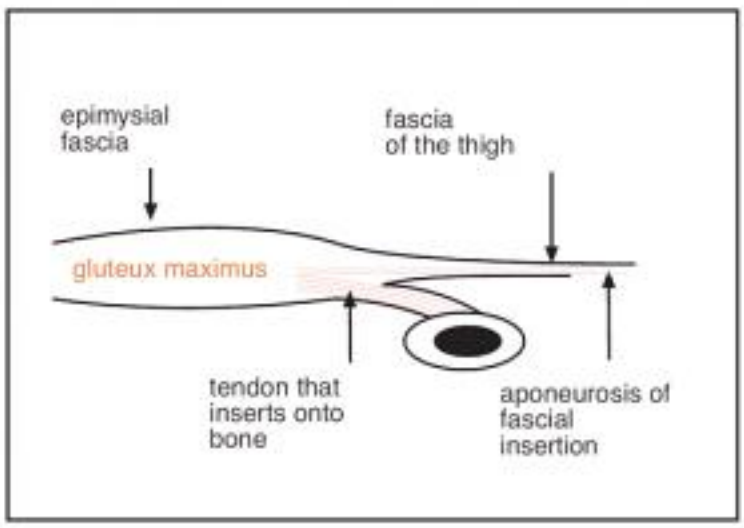

Fig. 16. Diagram of the fascia lata illustrating the conformation of the deep fascia in the limbs (longitudinal section).

teus maximus' aponeurosis extends laterally, beneath this connective tissue lamina, to join with the longitudinal aponeurosis of the tensor fasciae latae. This web of endofascial collagen fibres transmits information concerning contraction of one muscle to another synergic muscle in a more distal segment. As we have already seen, the large trunk muscles uniform their activity with the contralateral muscles via their aponeurotic-fascial continuity. For example, if a person is carrying an object in both arms, then the right pectoralis major muscle must develop the same force as the left pectoralis major. The pectoralis major fascia, which crosses over the sternum (Fig. 21), synchronises these two muscles, activating their respective muscle spindles in a uniform manner.

In the limbs, endofascial collagen fibres from the aponeurotic expansions guarantee this type of exchange of information. The aponeurotic expansion of gluteus maximus onto the iliotibial tract (Fig. 14), for example, can synchronise hip movements with movements of the knee (Fig. 16).

In anatomy, while great importance is given to

Fig. 17. Distal insertion of semitendinosus (detached proximally) onto the medial crural fascia.

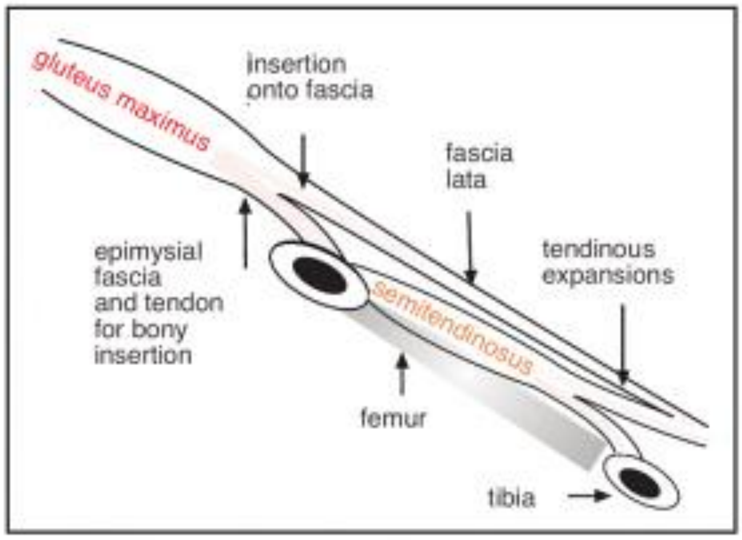

Fig. 18. Diagram illustrating myofascial insertions along the femoral and crural fasciae (longitudinal section).

the insertions of muscles onto bone, the insertions of muscles onto fascia are basically ignored. For example, the semitendinosus muscle (Fig. 17) glides under the fascia lata enclosed by its own epimysial fascia. Prior to its insertion onto the tibia, it sends tendinous expansions to the crural fascia; thereby forming, within the crural fascia itself, collagen fibres aligned according to traction produced by this same muscle (Fig. 18).

This tendinous expansion of semitendinosus has a double function:

- to traction the crural fascia proximally, informing the lower leg muscles about the state of contraction of the thigh muscles;
- to receive traction from lower leg muscles, in order to synchronise activity between the two segments.

Traction, in a proximal-distal direction, helps to coordinate and to adapt static muscle contractions in the lower limb to any postural variations of the trunk (Fig. 18). Distal to proximal traction helps to synchronise proximal muscle tension with motor variations in the extremities. When, for example, we are out walking and suddenly we hit our foot against an obstacle, then the entire lower limb and the trunk quickly adapt, even before we have time to realise what has happened. The endofascial collagen fibres are an essential source of information for the CNS during such a rapid and complex postural adjustment.

All of the muscles surrounded by the fascia lata and the crural fasciae send tendinous expansions onto these same fasciae [22], creating a type of retinaculum (Fig. 19).

The same happens in the upper limb: the latissimus dorsi, pectoralis major [23], and deltoid muscles all send tendinous expansions onto the brachial fascia before inserting onto the humerus. The two layers of epimysial fascia that accompany these expansions continue on, contributing to the brachial fascia.

Within the extracellular matrix of the deep fascia there are also elastic fibres. These fibres allow the fascia to adapt to any stretch from the previously mentioned aponeuroses, and to return to its physiological length afterwards.

If endofascial collagen fibres served only for the

[22] The popliteal fascia comprises two layers of collagen fibres that cross over each other. The superficial fibres are orientated transversally and they continue with the medial intermuscular septa; the deep fibres continue with the lateral septa, and are tensioned by the same muscles they sheath. (Lang J. 1988)

[23] Sappey has quite rightly indicated that the latissimus dorsi and pectoralis major muscles both send a large expansion onto the brachial fascia. (Testut L. 1987)

Fig. 19. Deep crural fascia, posterior region: retinaculum-like formation of collagen fibres.

Fig. 20. Antebrachial fascia (250x, Van Gieson); A, undulated collagen fibres; B, adipose layer, for gliding; C, parallel collagen fibres; D, adipose layer (for gliding) between two aponeurotic laminae.

reinforcement of the fascia, then there would be no need for the thin layers of loose connective tissue that facilitate gliding between one connective tissue lamina and the next[24] (Fig. 20).

Epimysial fascia

The deep fascia of the trunk often fuses with the epimysial fascia[25]. Hence, having removed the superficial fascia, we find that only a thin, connective tissue layer, acting as both deep fascia and epimysial fascia, encloses the large trunk muscles.

In the table regarding the deep fascia of the trunk (Fig. 1), we can see that beneath the hypodermis lies the external layer of the deep fascia's superficial lamina. These collagen fibres are inseparable from the epimysial fascia and are connected to the muscle fibres via numerous septa. Being undulated, they adapt to variations in muscle length, and, at the same time, they can effectively stretch the receptors that are embedded between them.

The large muscles of the trunk all terminate in aponeuroses (flat tendons). As already mentioned, via their deeper portion, these aponeuroses insert onto bone, whereas via their superficial collagen fibres they join with the aponeuroses of muscles on the opposite side of the body. We have seen that part of the latissimus dorsi's aponeurosis on one side continues with the aponeurosis of the contralateral gluteus maximus. Likewise, the pectoralis major aponeurosis on one side continues with that of the contralateral pectoralis major (Fig. 21); the trapezius aponeurosis on the right continues with that on the left (Fig. 22); and the external oblique aponeurosis continues with the aponeurosis of the contralateral internal oblique, and so forth. All of these aponeurotic connections function in a proximal-distal as well as a distal-proximal direction, synchronising the activity of the two muscles. This feedback mechanism plays a similar role to that already described for the collagen fibres in the femoral and crural fasciae.

The deep fascia of the limbs has the following conformation (see Fig. 1):

- externally, immediately beneath the hypodermis, we find the undulated collagen fibres of the deep fascia;
- within the split layer of the deep fascia we find aponeurotic-type collagen fibres;
- beneath the deep fascia there is a thin layer of

[24] For their asynchrony, the collagen fibre bundles must glide freely between one another in order to balance the tissue structure against any external tensional forces. (Threlkeld AJ, 1992)

[25] We assert that transversalis fascia is the inner epimysium of transversus abdominis muscle; no separate deep investing fascia exists. (Skandalakis P.N., 2006)

Fig. 21. Aponeurosis and fascia (superficial layer) of the right-sided pectoralis major passing over the sternum to continue with the aponeurosis and fascia of the contralateral pectoralis major.

Fig. 22. The aponeurotic fibres of the trapezius on one side continue with those on the contralateral side and are visible beneath the superficial fascia of the dorsum.

loose connective tissue, which allows for inter-fascial gliding;

- next we find the epimysial fascia that is continuous with the perimysium and the endomysial fascia of the muscle.

In this photograph of the triceps surae (Fig. 23.), we can see that the epimysial fascia continues with two tendinous formations:

- that of the proximal part of the gastrocnemius, similar to the flat aponeuroses of the trunk muscles;
- that of the distal part of gastrocnemius, typical of the fusiform muscles of the limbs.

Fig. 23. Epimysial fascia or epimysium of the triceps surae muscle.

The proximal aponeurosis inserts onto the popliteal fascia and is formed by the perimysium of only a few muscle fibres. On the contrary, the distal tendon is the continuation of the perimysium[26] of all the muscle fibres of the triceps surae.

The collagen fibres in the epimysial fascia have a fine, undulated and web-like conformation, as these fibres must respond to muscle as it shortens or lengthens, as well as to stretch of the endomysium and the muscle spindles (Fig. 24).

The epimysial fascia generally slides beneath the deep fascia[27], with the exception of those points where the muscles insert onto the fascia.

When a muscle is subjected to continuous tension (overuse, prolonged static postures), the undulated collagen fibres within its fascia tend to adopt the inextensible conformation typical of tendon fi-

[26] Epimysium and perimysium coalesce to form tendons. These data showed that epimysium incorporation into suturing improves capacity to bear forces compared with perimysium incorporation. (Kragh J.F., 2005)

[27] The deep fascia is a simple structure of densely-packed collagen bundles and elastic fibres, and has hyaluronic acid concentrated on its inner surface, which is in contact with the underlying muscle. The post- surgical specimens demonstrated preservation of the structure of the interface between fascia and muscle, including the retention of the hyaluronic acid lining, if the epimysium was intact. However, if the epimysium was disrupted, the structure of the interface was obliterated. (McCombe D., 2001)

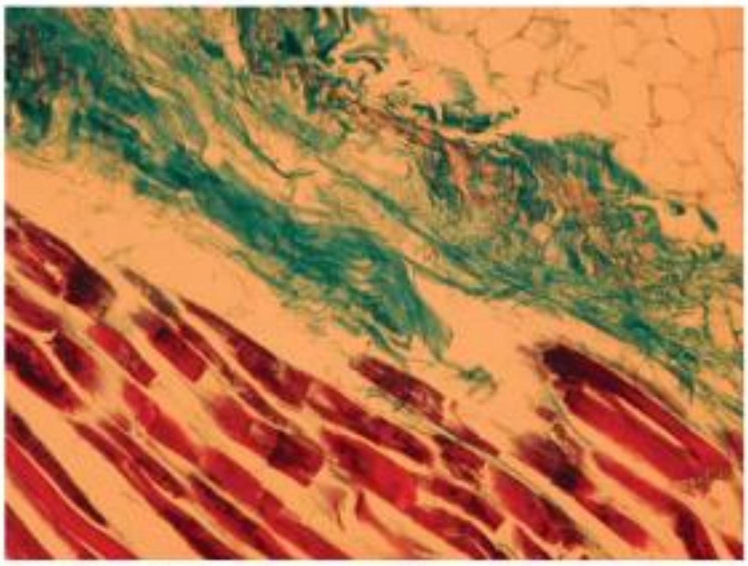

Fig. 24. Continuity of muscular fibres with endomysium and epimysial fascia (200x, Azan-Mallory).

bres[28]. This transformation of the connective tissue structure determines motor incoordination and resultant non-physiological tension is transmitted to the articulation, causing joint misalignment and pain.

Physiology of the Fasciae

The physiology of the fasciae is virtually incomprehensible unless it is examined together with muscle.

The **superficial** fascia provides for:

a) muscles to slide beneath the skin as they contract. Whenever, scars or burns cause skin to adhere to muscular fascia then movement is compromised;
b) the separation of the cutaneous perception (exteroception) from that of the deep muscular fascia (proprioception).

The **deep** fascia synchronises:

c) the activity of those motor units aligned in parallel that actuate the same movement (myofascial unit);
d) the activity of several muscles aligned in series that actuate the movement of a segment in the same direction (mf sequence).

Synchronous motor activity of muscles located in different segments are regulated by their own insertions onto the deep fascia[29].

Collagen fibre bundles with two fundamental orientations form the tendinous expansions of muscles onto the fascia:

- longitudinal, fibres that transmit tension along the motor trajectories of the spatial planes. These trajectories are comparable to the myokinetic chains or sequences. These longitudinal, myofascial "bridges" coordinate muscles moving different body segments along a specific trajectory, particularly in virtue of the fact that they have a strong resistance to traction. In fact, we have used dynamometers to measure their resistance to traction, and all are capable of sustaining several kilograms of traction.
- oblique, these fibres transmit tension developed by the oblique muscle fibres, those that generally intervene in complex, dynamic, spiral-form motor gestures.

These longitudinal and oblique fibre bundles are located within the deep fascia of the limbs, whereas in the trunk they are found within the connective tissue skeleton of the muscles.

Two fundamental functions are attributed to the fascia:

– the perception of movement in the three spatial dimensions (mf sequences) and during the motor schemes (mf spirals)
– the motor coordination between static postural muscles (mf sequences) and between muscles involved in dynamic gestures (mf spirals)

Motor perception is determined by neuro-receptors such as Ruffini corpuscles, Pacini corpuscles, Golgi corpuscles, and free nerve endings (Fig. 25).

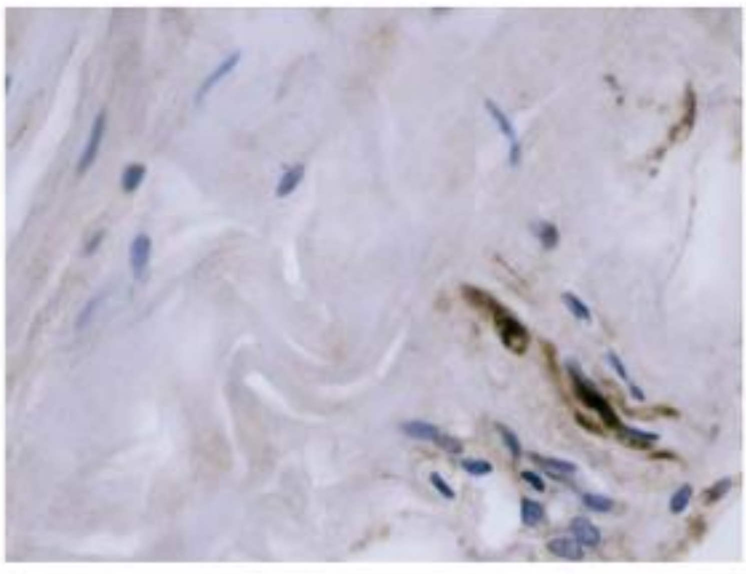

Fig. 25. Section of crural fascia (400 x, S100) highlighting free nerve endings (brown) aligned with undulating collagen fibres.

[28] The first phenomena, of both hysteresis and stress-relaxation, demonstrated an increased stiffness of the thoracolumbar fascia when it is stretched in succession. When the fascia is stretched in succession, it diminishes its capacity for deformation. (Yahia L.H., 1993)

[29] In hand reconstructive surgery, the palmaris longus muscle is one of the most utilized donor sites for tendon reconstruction procedures. Even in cases of an accessory palmaris longus it has been noted that it always inserts onto the deep fascia. (Tiengo C., 2006)

As these neuroreceptors are activated by stretch, they can only function correctly if they are embedded in a tissue that is capable of lengthening. Regardless of which part of the body they are located, they always transmit the same type of nerve impulse to the brain. In order that this information has a directional significance, these receptors must be situated within a structure that has a precise, topographical orientation. The body's fascial compartments, together with its intermuscular septa, form just that sort of structure because it corresponds to the three spatial dimensions.

In the anterior region of the limbs, fascial compartments enclosing muscles that move all body segments forward, or anteriorly, have formed. In the posterior region of the limbs, another sequence of fascial compartments encloses the extensor muscles. In the lateral and medial regions of the limbs, we find the intermuscular septa, which are stretched by the abductor and adductor muscles. These same sequences are found in the trunk, but with the following variations. The paravertebral muscles are distributed in two compartments (the right and the left erector spinae). The rectus abdominis is comprised within two fascial compartments, divided by the linea alba. Two ipsilateral forces (iliocostalis and obliques) actuate lateral flexion of the trunk. The contraction of these muscles also stretches their surrounding fascia, consequently activating receptors. In fact, when we bend sideways we tend to perceive movement at the level of the trunk wall rather than from the periarticular receptors of the vertebrae.

Fascia intervenes in **motor coordination**[30]. Muscle spindles and Golgi tendon organs are the nerve terminations that regulate muscular contraction. Muscle spindles are embedded in the endomysium, in parallel with the muscle fibres. The Golgi tendon organs are embedded in the myotendinous junctions, in series with the muscle fibres. The continuity of the endomysium with the connective tissue skeleton ensures transmission of spindle contraction to the entire fascia. Obviously, this continuity can operate in the opposite sense, so that passive stretch of a muscle can activate even a single muscle spindle. In fact, spindles can be stimulated actively, via the gamma fibre circuit, or passively, by stretch of their muscle. However, these mechanisms can only be activated correctly if the fascia maintains its physiological elasticity. If fascia is too rigid it cannot adapt to the stretch of a single muscle spindle, and the enlargement of the central part of the spindle with the subsequent firing of the annulospiral fibres does not take place. Golgi tendon organs also have a web of collagen fibres surrounding their axons; these fibres wind up or unwind, according to the direction of stretch to which they are subjected, such that the inhibitory nerve impulse may or may not be activated.

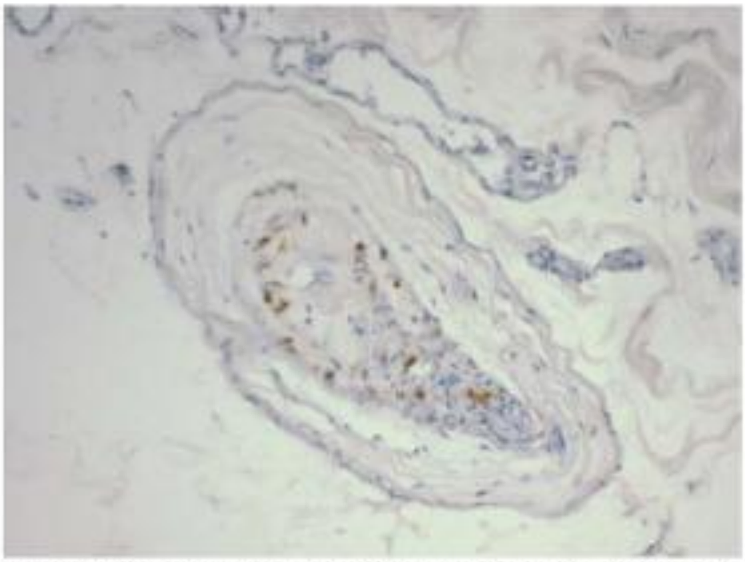

Fig. 26. Neuroreceptor: Pacini corpuscle (100x, immunohisto-chemicalS100).

Innervation of the fascia varies according to the function of the fascia itself:

- in the superficial fascia we find thermoreceptors and pressure sensitive receptors such as Pacini corpuscles (Fig. 26). A concentric lamellar structure contributes to the activation of these receptors' nerve impulses and, because they are activated by pressure, then the subcutaneous, loose connective tissue is their most suitable tissue environment.
- we find different receptors in the deep fascia:
  - in the retinacula there are various types of receptors, all suited to interpreting the multiple functions of this structure;
  - in the epimysial fascia and the endomysium there are the muscle spindles;
  - in the passage from muscle to tendon there are the myotendinous organs of Golgi;
  - along the fascial compartments there are mostly free nerve endings, activated by muscular stretch.

[30] The rectovaginal septum is formed by a web of collagen and elastic fibres, and smooth muscle cells with nerve fibres that emerge from the hypogastric plexus. With variations in the endorectal pressure, this septum pays an active role in modulating the muscle tone of the pelvic walls. (Stecco C., 2005)

As already mentioned, both undulated and parallel collagen fibres are found within the fascia. When the undulated fibres lengthen, they can stretch the free nerve endings, whereas parallel collagen fibres transmit tension from one muscle to another in an adjacent segment.

Hence, the extensible fibres are necessary for motor perception and the parallel fibres for motor coordination between the various muscles. If fascia comprised only undulating collagen fibres, then it would only have a perceptive role; if fascia comprised only parallel fibres, then it could only have a role in tension transmission and, subsequently, coordination.

The receptors of the deep fascia are all proprioceptors that are capable of acting as nociceptors whenever they are stretched beyond their normal physiological limit.

Cutaneous receptors are all exteroreceptors. In the galea aponeurotica, the palms of the hand and the soles of the feet, many collagen fibres unite skin to deep fascia; hence, the receptors in these regions have both a proprioceptive and an exteroreceptive role.

Part I
The Centres of Coordination

1

FASCIAL MANIPULATION

Two fundamental aspects of the fascia form the bases of the method presented in this book:

- recent research indicating that fascia could play an important role in coordination and proprioception (Huijing P, 2001) and, consequently, in the control of posture and complex movements;
- the remarkable plasticity of fascial tissue [1] (if over stimulated it modifies its texture) as well as its malleability [2], (manipulation can restore its physiological elasticity).

In this chapter, we will analyse the role of fascia in the motor control of a single segment (A) and in the control of posture (B).

In the following chapter, we will examine how manipulation can exploit fascial malleability in the treatment of myofascial pain.

A - Fascial control of segmental movement

Exactly how the nervous system controls the enormous quantity of independent variables simultaneously present within any given movement is one of the key problems faced by Neuroscience today. These variables include:

- kinematic variables: available joint range, velocity, acceleration;
- dynamic variables: muscular force, torques, and power;
- neuronal variables: temporal and spatial parameters for recruitment of single motor units (Rulli M, 2005).

Sherrington attempted to explain muscular recruitment synergies via peripheral neuronal mechanisms (reflexes).

According to Bernstein (1967), the contribution of reflexes could not resolve the problem of coordination entirely. Bonds, possibly formed through learning processes, were then hypothesised.

Reflexes plus learnt bonds could explain unvaried, or standardised, motor patterns but are inadequate in explaining the adaptability of our gestures to sudden, unpredictable variations within any given situation.

Schmied (1993) showed that synchronisation of motor units modifies in the presence of visual and auditory feedback.

Bennett (1994) demonstrated that neuronal facilitation of hand muscles by the motor cortex varies during precision grip tasks, thereby adapting muscular activity to a specific task.

We attribute fascia with an active role in these peripheral mechanisms controlling muscular synergies. We hypothesise that **the myofascial unit, the myofascial sequence, and the myofascial spiral** manage this task-dependent recruitment.

Whilst the intent of this text is to provide practical clinical indications, further research is clearly necessary to clarify these underlying physiological mechanisms.

Nevertheless, results obtained through application of this method demonstrate that a hypothesis of fascial involvement in peripheral motor coordination is worth consideration.

The myofascial unit

Recent experiments (Smeulders M, 2005) demonstrate that 37% of muscular force is transmitted not only to tendon insertions but also to adjacent structures. Given that muscular insertions onto septa and fascia develop a considerably minor force as

[1] Poorly functioning fascia (inflammation, adherences, postural stress) causes cross-linking between fibre collagen molecules, with consequent adhesions and reduced mobility. The extracellular matrix becomes dense or viscous, interfering with normal catabolism and anabolism. (Hertling D., 2005)

[2] Connective tissue is a colloidal substance in which the ground substance can be influenced by the application of energy (heat or mechanical pressure) to change its aggregate form from a more dense 'gel' state to a more fluid 'sol' state (thixotropy). (Schleip R., 2003)

Fig. 1.1. Having sectioned and hooked back the fascia lata of the anterior region of the thigh, numerous adherences to the epimysial fasciae are visible.

compared to insertions onto bone, the question arises as to why the body "needlessly" disperses such a significant quantity of energy. Fascial structures are, in fact, partially elastic, therefore they adapt to muscle contraction.

Analysis of the myofascial unit provides answers to this apparent illogicality: fascia connects all of the motor units that act on a single joint in parallel[3]. In our dissections, we have seen that anatomical reality is quite different from illustrations found in some anatomical atlases. In the above specimen (Fig. 1.1), all of the collagen fibre connections or "bridges" between the fasciae of adjacent muscles have been left intact.

Numerous septa originating from the internal surface of the deep fascia connect with the epimysial fascia. Epimysial fascia is continuous with perimysium and this, in turn, with endomysium. Huijing (2001) also affirms: "Extra-muscular connective tissue has an intimate connection with intra-muscular connective tissue, such as to be capable of force transmission".

Fascia does not only connect these muscular fibres passively. It is also directly involved in muscle spindle activity. In fact, whenever a muscle lengthens its spindles are passively stretched because they are inserted within the endomysium of that muscle. Whenever firing of gamma nerve fibres causes contraction of intrafusal muscle fibres, spindles actively traction the endomysium. (Baldissera F. 1996).

This type of adaptability requires an elastic fascial system, capable of responding to spindle stretch by shortening and closing-off the alpha-gamma circuit.

Physiology of the myofascial unit

Whenever a nerve impulse activates a motor unit then all of the muscle fibres within that unit will contract. However, these fibres do not all contract simultaneously (jack knife effect). The exact position of the joint on which they act determines which fibres contract. It has been demonstrated[4] (Ninos J., 1997, Sheehy P., 1998), that during knee extension the thousands of knee extensor fibres are not all activated simultaneously. They intervene according to the degree of knee joint position. This infers a continuous feedback /feedforward mechanism within each myofascial unit. Fascia is subject to different tension according to changes in the degree of joint movement. This determines variations in the adaptation of fascia to muscle spindle stretch, with consequent variations in recruitment of relative muscle fibres.

Logically, in order to synchronise all muscle fibres that move a joint in one direction, a single point of reference is also fundamental. For all muscle spindles connected to a specific sector of fascia this reference point is called the vectorial centre, or centre of coordination (CC). For example, contraction of latissimus dorsi, teres major, infraspinatus and the spinal (scapular) part of deltoid results in retromotion of the humerus. Anatomy texts often illustrate these muscles as isolated entities but a series of fascial "bridges" (Fig. 1.2) actually unite them, focusing their contractile force towards a single vectorial centre, or centre of coordination, for retromotion of the humerus.

In summary, those motor units involved in moving a segment in a specific direction, together with their accompanying fascia, form a myofascial unit

[3] Striated muscle, surrounded by areolar and dense connective tissue, form an inseparable unit known as myofascia. (Hertling D., 2005)

[4] Surface electromyography and motor analysis were recorded simultaneously during knee flexion between 10° to 60° degrees. Significant changes in the muscular activity of vastus lateralis and medialis were recorded during the varying degrees of knee flexion whereas no changes in biceps femoris were recorded electromyographically. (Ninos J., 1997)

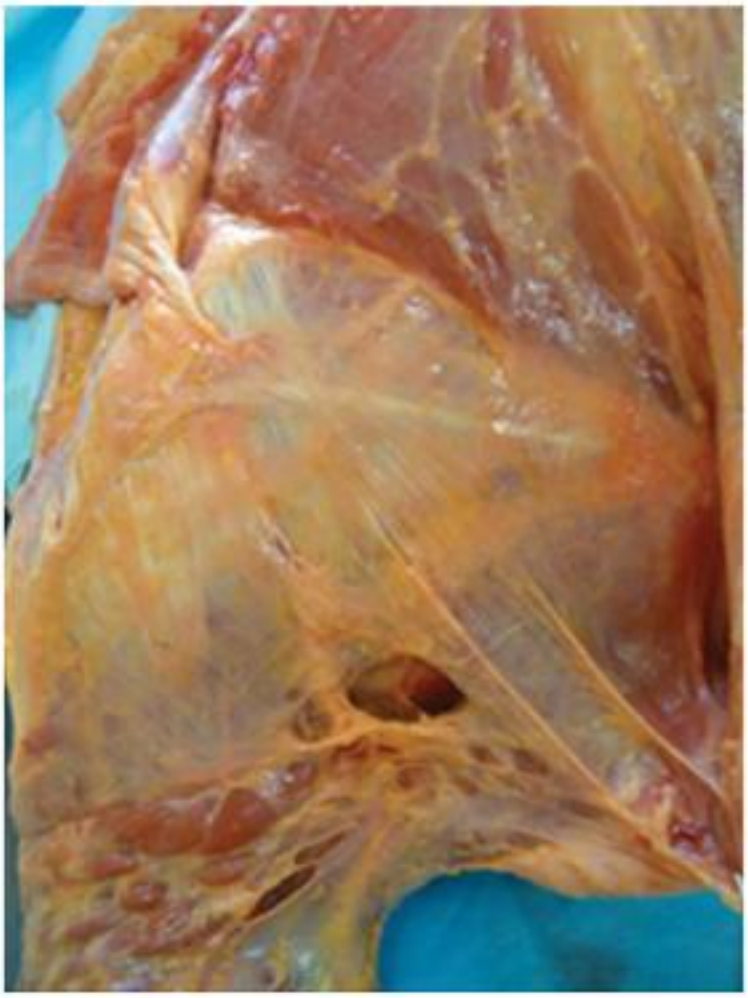

Fig.1.2. Dissection of the scapular region highights collagen fibres that extend from latissimus dorsi to the infraspinatus fascia, and also the deltoid fascia (below).

(mf). Within the overlying fascia, which is always continuous with the muscle fibres of every myofascial unit, we can identify a specific centre of coordination (cc). We can also identify a so-called centre of perception (cp) in the fascia that extends over the moving joint.

Every centre of coordination has a precise anatomical location within the fascia. These points are situated where traction, resulting from motor unit activity involved in a specific movement, converges.

The centre of perception (CP or cp) is located in the joint, which is moved by the relative myofascial unit.

Any consolidated alteration (or fibrosis) of the fascia comprising the centre of coordination results in incoordinate movement, with consequent irritation of articular nociceptors (cp or area of referred pain). In this case, the altered cc becomes the cause of pain and the joint (cp) is where pain manifests (effect). Even when there is only an atypical fascial tension, the cp can be the site of pain. In this case, pain can be more diffuse: it may invest the entire joint or manifest itself in the antagonist mf unit or, sometimes, it extends along all of the myokinetic chain.

Anatomy of the myofascial unit

Monoarticular and biarticular muscle fibres form each mf unit (Stecco L, 2002):

- monoarticular fibres comprised within a mf unit intervene only in movements actuated by that specific mf unit;
- biarticular fibres function both within a single mf unit, as well as on proximal or distal mf units. For example, monoarticular fibres (soleus) and biarticular fibres (gastrocnemius) form the mf unit of retro-talus. Soleus acts only during retromotion of the talus while gastrocnemius is also involved in retromotion genu (knee) and pes (foot).

Hence, biarticular fibres provide fascial continuity along a sequence. This explains why treatment of a single segmental cc, at times, benefits all of the mf sequence and not only the pertinent cp of the specific mf unit being manipulated. These positive effects are assured when, during compression over a cc, referred pain extends in a proximal and/or distal direction.

Biarticular fibres intervene on the proximal or distal segment according to the selected or programmed movement. For example, many muscles involved in movement of the pelvis are also involved in movement of the thigh. Their selective recruitment will depend on:

- for the pelvis, if closed chain movements are required (i.e. during weightbearing)
- for the hip, if open chain movements are required (i.e. when the thigh is free to move, such as the swing phase of gait, kicking etc.).

The body segments

Each mf unit comprises a joint, the accompanying fascia, the bones, and the various muscle fibres that move this joint. Therefore, a myofascial unit extends well beyond the usual confines of bones or joints. The term shoulder, for example, necessarily includes the scapulo-thoracic articulation, the glenohumeral and the acromio-clavicular articulations. The term "glenohumeral" defines the articulation without considering all of the muscles that move this joint. In Italian, the term "humerus" indicates the bone, whereas in Latin and Spanish it means "shoulder". For these reasons, when referring to mf units, we have decided to adopt a new terminology for the body segments (Fig. 1.3), utilising terms derived from Latin and used internationally (Tab. 1.1).

Whilst primitive fish have single segment bodies that move as a single myofascial unit, humans have numerous segments that move independently from one another.

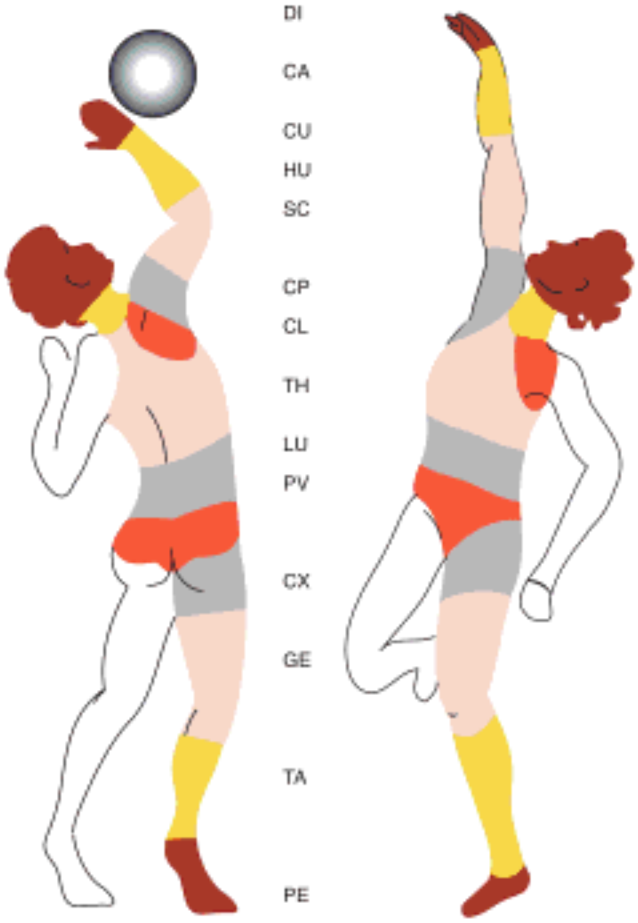

Fig.1.3. Anatomical boundaries of the myofascial units.

Tab. 1.1. Terms used to indicate body segments and their abbreviations

Abbr.	*Termini latini*	*English*
di	Digiti	fingers
ca	Carpus	wrist
cu	Cubitus	elbow
hu	Humerus	shoulder
sc	Scapula	scapula
cp	Caput	head
cl	Collum	neck
th	Thorax	thorax
lu	Lumbi	lumbar
pv	Pelvi	pelvis
cx	Coxa	thigh
ge	Genu	knee
ta	Talus	ankle
pe	Pes	foot

For example, lateral neck flexion can occur while the thorax remains stable or, likewise, lumbar rotation in one direction with pelvis rotation in the opposite direction.

Apart from the trunk, quadrupeds also have four limbs that comprise four main articulations

- coxa-femoral and glenohumeral joints,
- elbow or cubitus and knee joints,
- tibiotarsal and radio-carpal joints,
- the joints of the hands and the feet. In fact, only primates have developed independent movements of the fingers and toes.

Specific muscles, connected together by precise fasciae, move the joints of the limbs and the trunk.

A brief definition of the anatomical boundaries of each mf unit (Fig. 1.3) is as follows:

The digiti segment (DI) includes the distal row of carpal bones, all the metacarpals, and all the phalanges of the fingers. The single fingers of the hand are indicated with Roman numbers (I° for the thumb; II for the index finger, III° for the middle finger, etc).

The segment of the carpus (CA) comprises the proximal row of carpal bones and the distal two thirds of the forearm.

The cubitus segment (CU) comprises the proximal third of the forearm and the distal two thirds of the upper arm. This division respects the distribution of those muscular fibres (of biceps brachii, brachioradialis, and triceps) that move the elbow joint.

The humerus segment (HU) includes the glenohumeral joint and those muscular fibres of deltoid, biceps brachii, and triceps that intervene in shoulder joint movements.

The segment of the scapula (SC) comprises bones and muscles of the shoulder girdle, excluding those of the above mentioned humerus segment.

The caput segment (CP) comprises the head, and includes three subunits: the eyes, mandible, and ears. The abbreviation cp1indicates the subunit of the eyes, cp 2 that of the mandible, and cp 3 that of the ears.

The collum (CL) extends from the first to the seventh cervical vertebra.

The thorax segment (TH) comprises the rib cage with the twelve thoracic vertebrae.

The lumbi (LU) comprises the lumbar vertebrae and the portion of the abdomen above the umbilicis.

The pelvis segment (PV) comprises part of the ischium, the crest of the ilium, the sacrum and, anteriorly, the pubic symphysis.

The coxa segment (CX) comprises the hip joint (acetabulum, femur head and neck), the proximal half of the thigh, and the sacrotuberous and sacropsinous ligaments.

The genu (GE) extends from halfway on the thigh to, anteriorly, the tibial tuberosity and, posteriorly, to the proximal third of triceps surae.

The talus (TA) comprises those muscle fibres in the lower leg that move the talus in the three spatial planes.

The pes (PE) comprises a part of the calcaneus, a part of the tarsus and all of the metatarsal-phalangeal bones. Each toe is numbered in a similar manner to the fingers (1° for the hallux, II° for the second toe etc.).

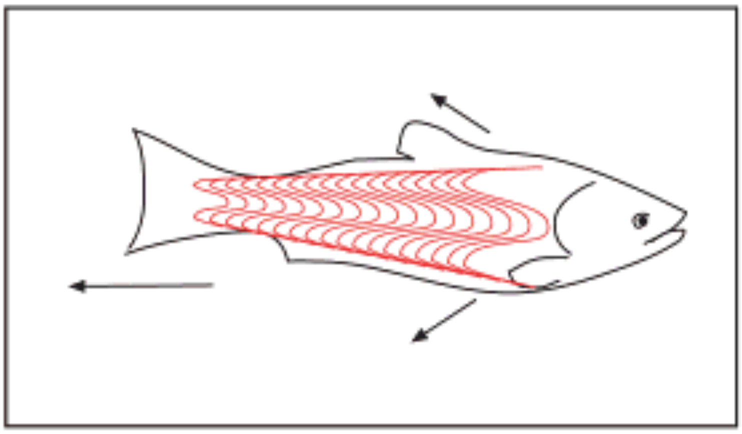

Fig.1.4. In an aquatic setting, lateromotion produces forward movement.

These boundaries are not absolute. For example, in the leg we find muscles that move the tarsus as well as the toes. The same is true of the carpus and the fingers in the hand. When applying this method it is useful to remember this "merging" of some segments.

However, in general, the above outline aids in comprehension of mf unit function, as well as how to define the precise localisation of pain.

Tab. 1.2. Old and new terminology describing movement on the three spatial planes and the abbreviations

Frontal plane	
Lateromotion **LA** Abduction	Mediomotion **ME** Adduction
Sagittal plane	
Antemotion **AN** Flexion	Retromotion **RE** Extension
Horizontal plane	
Intrarotation **IR** Pronation	Extrarotation **ER** Supination

Body movements

In fish, movements on the frontal plane dominate as they advance in the aquatic environment using lateral motion of their entire body (Fig. 1.4).

In a terrestrial environment the trunk can flex to the left and right (lateromotion), it bends forwards and backwards (ante and retromotion), and it rotates externally and internally (extra and intrarotation).

Movements of lateromotion occur on a frontal plane, those of ante and retromotion on a sagittal plane whereas rotation occurs on a horizontal plane (Tab. 1.2).

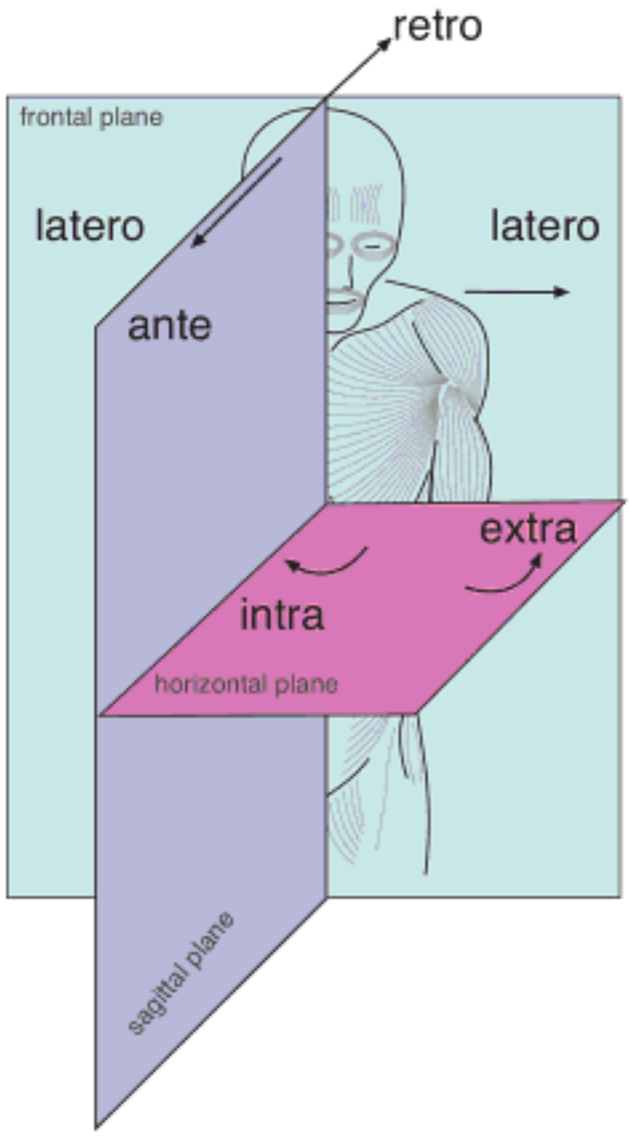

Fig.1.5. Directions and planes of movement.

We have chosen to use directional terms to describe the movements of the body segments rather than using conventional terms, which are sometimes contradictory. For example, forward movement of the hip is called flexion, whereas a backward movement of the knee is also called flexion. The term flexion refers to the closure of a joint without respecting the exact direction of the movement. We prefer to use terms such as latero-medio, ante-retro, and intra-extra (Fig. 1.5) because the motor cortex actually programs movement according to spatial directions and not according to the opening or closing of joints (Kandel ER, 1994).

Given that each body segment moves on the three spatial planes then, for each segment, there are six myofascial units; for example, in the coxa segment we find:

- the myofascial unit of ante-coxa (an-cx) that moves the hip forwards,
- the mf unit di retro-coxa (re-cx) that moves the hip backwards,

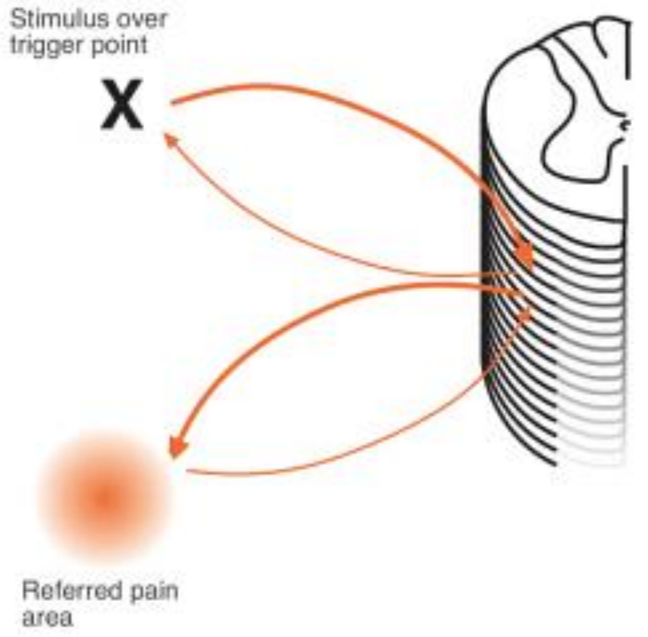

Fig.1.6. Relationship between trigger point and referred pain pattern, according to Travell.

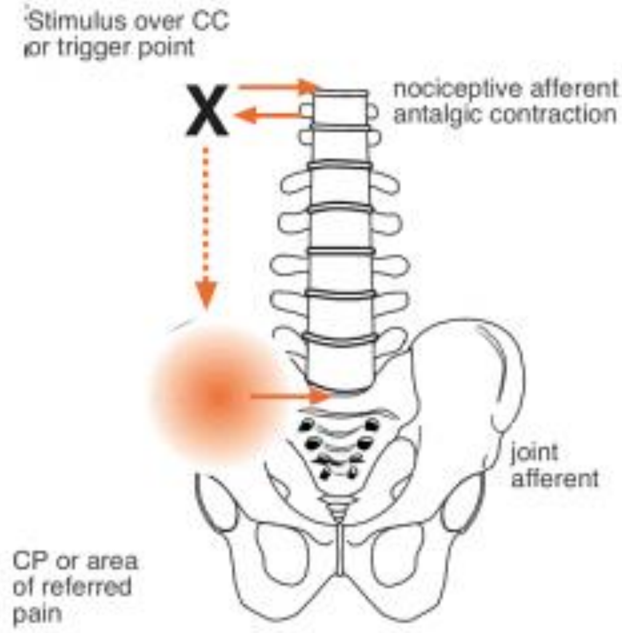

Fig.1.7. Compression of a CC causes pain with consequent antalgic contracture and activation of articular nerve terminations (afferences) due to overstretch.

- the mf unit of latero-coxa (la-cx) that moves the hip laterally,
- the mf unit of medio-coxa (me-cx) that moves the hip medially, to the median line,
- the mf unit of intra-coxa (ir-cx) that rotates the hip inwardly,
- the mf unit of extra-coxa (er-cx) that rotates the hip outwardly.

The three posterior mf units (re, la, er) are antagonists to the three anterior mf units (an, me, ir). Therefore, we consider agonist and antagonist mf units, rather than agonist and antagonist muscles.

Referred pain and Centre of Perception (CP)

For thousands of years it has been common knowledge that compression of precise points on the body can provoke specific, referred pain patterns[5]. These points have a precise location in all individuals[6]; however, referred pain varies from individual to individual[7]; it does not follow nerve pathways (Hwang M, 2005) or single muscle conformation.

Whilst extended research into the explanation of trigger points has taken into consideration myofibrils[8], skin, vessels, and nerve reflexes[9], fascia itself has been somewhat ignored.

According to Travell, trigger points refer myofascial pain over a specific topographical distribution, characteristic to each muscle. Direct compression, acute stress, chronic fatigue, trauma, and cold can activate trigger points (TP), as well as visceral disease and emotional disturbances.

To explain the relationship between a trigger point and its referred pain pattern (Fig. 1.6), Travell refers to the spinal reflex arcs; that is, both the TP's nociceptive afferent and the feedback from the reflex pain area converge to the same destination.

This would result in a constant referred pain pattern but, actually, this pattern is variable (Hwang M, 2005): at times, pain can extend to the nearby joint and, at times, along an entire limb. For example, pressure over the paravertebral muscles of a lumbalgic patient causes referred pain to extend towards the lumbosacral joint (Fig. 1.7). However,

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[5] Myofascial trigger point diagnostic criteria are: 1, a tender spot in a taut band of skeletal muscle; 2, a local-twitch response of some muscular fibres in response to stimulus of a TP; 3, predicted pain referral pattern, in response to mechanical stimulus of a TP. (Travell e Simons)

[6] A TP provokes a typical elettromiographical signal, while adjacent parts of the same muscle are silent. It could be that muscle spindles have an important role in the pathophysiology of a myofascial TP. (Hubbard e Berkoff, 1993)

[7] Multiple stimulation of a specific TP in the same individual riproduces the exact area of referred pain more precisely than stimulation of the same TP in different individuals. Referred pain, other than that from muscular sources, can have origin from other structures, namely, skin, joint facets, and internal organs. (Grobli C., 2003)

[8] Up until today, there is no significant proof to support the hypothesis of histological changes in TPs in humans. In 1951 Glogowsky and Walfraff were able to establish myofibril distruction in myogelosis. Nearly 20 years later Fassbender, during electromicroscopic analysis of myogelosis, found degeneration of band I myofilaments. Finally, Pongratz and Spath observed degeneration of muscle fibres in the presence of edematous reactions. (Grobli C., 2003)

[9] It is probable that the observed phenomena concerning interneurones in the dorsal horn could be considered as the origin of TP referred pain. (Grobli C., 2003)

pressure over the same muscles in a patient with sciatic-type pain, can cause pain to extend down the entire lower limb. Pressure applied posteriorly, towards the tendinous insertions onto the vertebrae or ribs can propagate referred pain anteriorly, towards the abdomen or the inguinal region.

We have acertained that these three patterns of referred pain correspond to certain conformations of the fascia: namely, the mf unit, the mf sequence, and the mf spiral.

The pattern of referred pain within a mf unit can be explained as follows: compression of an active trigger point, or centre of coordination (cc), determines a nociceptive signal, which causes contraction of the specific muscular chain coordinated by that cc (Fig. 1.7). An active cc implies that the fascia is already in an altered state. Therefore, this antalgic, reflex contraction is poorly coordinated, resulting in an incongruous effect on the pertinent joint. Non-physiological stretch of the periarticular receptors produces yet another nociceptive signal. Afferent nerves will convey the pain sensation to a spinal segment related to the joint being moved in an anomolous manner (cp), rather than to the segment connected to the cc, or trigger point. In fact, if the fascia where the cc is located is in a normal, elastic state, then its compression produces a local, tactile sensation without determining pain and antalgic contractions.

We will now examine the practical application of this antalgic mechanism. When a joint is painful, it is not the painful joint (area of referred pain) that requires treatment, but the motor source (muscle-fascia surrounding the cc). More precisely, if a joint pain manifests itself anteriorly (an) then, presumably, it is the mf unit of antemotion that is acting incongruously. Hence, from the site of pain we can deduce which cc is dysfunctional. Joint pain in the posterior region (re) implicates the mf unit of retromotion. If joint pain is in the lateral region (la) we can hypothesise a compromised mf unit of lateromotion. Similarly, a medial site of pain (me) can indicate the mf unit of mediomotion. In this text, for each mf unit, we will describe the anatomical location where pain may manifest and the exact location of the corresponding centre of coordination.

Myofascial pain is one of the most frequent afflictions of the locomotor system. Nonetheless, it is often overlooked in the medical field and patients suffering pain are often subjected to a series of instrumental tests that can prove to be superfluous.

For example, a patient presenting with a painful shoulder is often subjected to X-rays, to exclude micro-fractures; then an ultrasound scan to exclude bursitis, followed by a MRI to examine possible rotator cuff lesions. In absence of any positivity, bone densitometry for decalcification may follow whilst, simultaneously, blood tests are usually ordered to exclude infection or malignous processes…meanwhile the person continues to suffer. Instead, an immediate application of fascial manipulation may resolve their pain, confirming a diagnosis of myofascial pain. Clearly, if after two or three treatment sessions symptoms remain unvaried, a therapist should refer the person to other specialists for further investigations.

B - Fascial control of posture

Fascia extends throughout the body and it unites all body segments. In some ways, this reflects the definition that Guidetti gives to posture: "We can define Posture as all those positions assumed by the body in which a particular relationship between the diverse body segments is emphasized" (Guidetti G., 1997).

Basal fascial tension stimulates the receptors embedded within the fascia and the resulting afferent impulses, conveyed to the central nervous system, contribute to postural control. These afferent impulses are effectively the same from all of the body; they only acquire a directional and positional significance if mapped out within the context of a precise fascial architecture.

In fact, the fascia is divided into specific compartments for each myokinetic chain:

- myofascial sequences that move the body forwards and backwards (sagittal plane);
- myofascial sequences that move the body laterally and towards the median line (frontal plane);
- myofascial sequences that move the various segments into intrarotation and extrarotation (horizontal plane).

Fascia not only provides a directional significance to afferent nerve impulses. Via its endofascial collagen fibres, it also intervenes in the active management of movement.

The myofascial sequence

The mf units that move body segments in the same direction on one plane form each sequence. Muscular insertions onto the overlying fascia synchronise the activity of these mf units.

For example, in the anterior region of the upper limb we find a fascial compartment surrounding the mf unit of ante-cubitus in the upper arm and ante-car-

Fig.1.8. The lacertus fibrosus of biceps brachii acts as a bridge between the mf unit of ante-cubitus and that of ante-carpus.

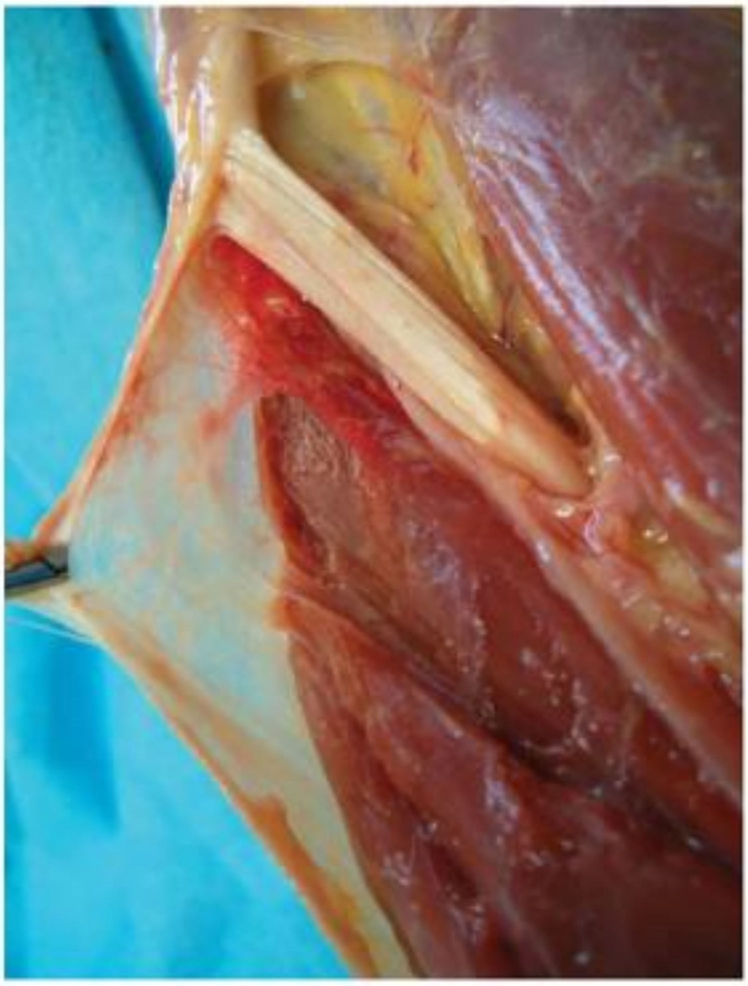

Fig.1.9. Antebrachial fascia sectioned and stretched back to highlight origin of flexor carpi radialis fibres.

pus in the forearm. The fascial "bridge" of lacertus fibrosus unites these two mf units (Fig. 1.8).

When biceps brachii and brachialis contract (an-cu) lacertus fibrosus traction draws the antebrachial fascia in a proximal direction. When flexor radialis carpi contracts, the point where the lacertus fibrosus inserts onto the antebrachial fascia is pulled in a distal direction.

This traction is possible because some muscle fibres of flexor carpi radialis originate from the overlying antebrachial fascia (Fig. 1.9). Thus, it is the continuity of the collagen fibres of the fascia that synchronises the flexor muscles or mf units of antemotion during forward (antemotion) movement of the upper limb.

Physiology of the mf sequence

Mf sequences are named with the same directional terminology as the mf units: ante, retro, latero etc. Mf sequences do correspond to the myokinetic chains of flexion, extension, adduction, abduction, intra and extrarotation, but they also introduce the concept of fascial coordination between the single mf units. This coordination between individual mf units could be actuated via feedback between fascia and the muscle spindles. Spindles are activated in two ways: or via direct stimulation from the central nervous system or via passive stretch.

- Direct stimulation of muscle spindles by gamma efferent fibres causes contraction of intrafusal muscle fibres. Spindles do insert onto the endomysium-perimysium, hence, any contraction stretches this connective tissue surround. Contraction of numerous spindles conveys tension to the deep epimysial fascia from various angles, forming vectors that converge towards the centre of coordination of the single mf units. If this cc is elastic then these spindles can shorten in length, dilating their median receptor portion, resulting in correct propagation of Ia afferent impulses, with subsequent activation of alpha efferent fibre impulses. These alpha fibre impulses produce contraction of the extrafusal muscle

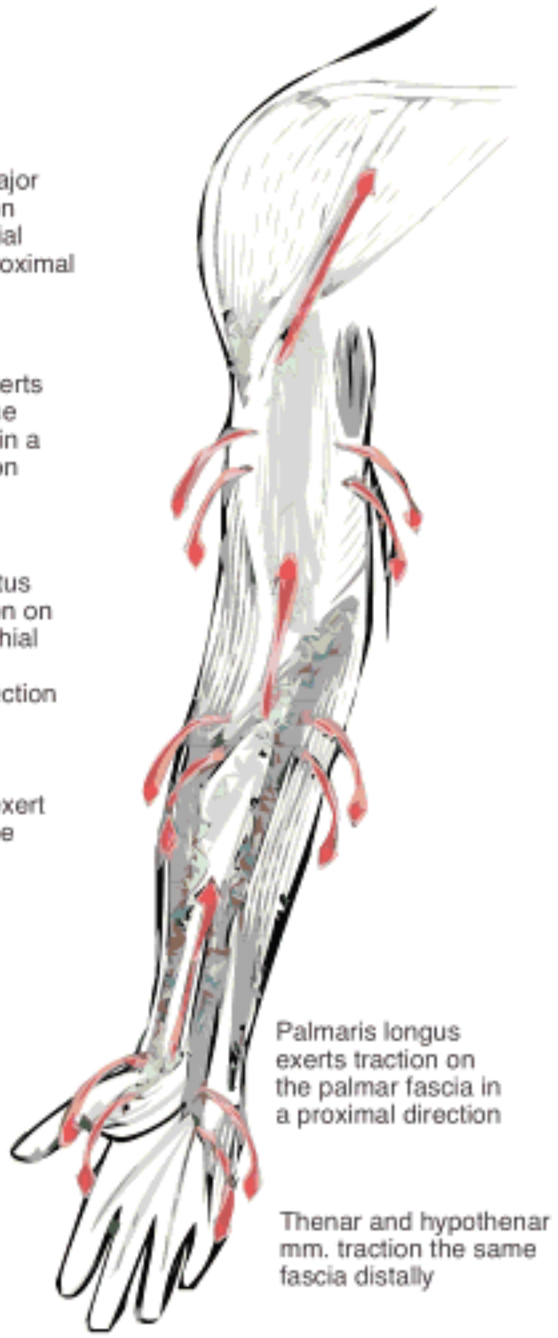

Fig.1.10. Mf sequence of antemotion in the upper limb.

fibres. For the most part, the force of contraction is transmitted to the tendon or bony insertions bringing about movement, however, a part of this force is transmitted to the many small myotendons that insert onto the fascia.

- Passive stretch of muscle spindles occcurs via the myotendinous insertions that numerous muscles extend onto the fascia. This type of spindle activation could synchronise the action of two adjacent, unidirectional mf units. In fact, in every mf unit we can find these tendinous expansions that insert onto the fascia of adjoining mf units. Wherever the muscle is fusiform in shape then we find a fusiform aponeurosis; where the muscle is quadrate, with an ample extension of its myofascial insertion, then the aponeurosis is thinner and wider.

Anatomy of the mf sequence

The myofascial insertions along the antemotion sequence will now be examined. The mf unit of ante-humerus (an-hu) is composed of biarticular (clavicular part of deltoid and pectoralis major) and monoarticular muscles (coracobrachialis). Pectoralis major extends a tendinous expansion onto the anterior brachial fascia, and coracobrachialis inserts, in part, onto the medial intermuscular septum.

When these muscles contract, the brachial fasciae tense slightly (note arrow pointing in a proximal direction, Fig. 1.10); this delicate stretch of the brachial fascia is sufficient to activate, or better still, synchronise the muscle spindles of the brachialis muscle. Many fibres of the brachialis muscle originate from the lateral and medial intermuscular septa; its contraction stretches the brachial fascia in a distal direction (note four oblique arrows, Fig. 1.10). This guarantees a continuous feedback between the mf units of ante-humerus and ante-cubitus. During elbow flexion, not only brachialis is active, but also biceps brachii. Via the lacertus fibrosus, contraction of biceps brachii stretches the anterior region of the antebrachial fascia. This determines a passive stretch to the muscle spindles of the mf unit of ante-carpus. Contraction of those muscles governing antemotion of the carpus (flexor carpi radialis and palmaris longus), stretches the thenar and hypothenar eminence fasciae, which take origin from the palmaris longus itself. This anatomical continuum demonstrates just how important it is that the fascia always maintains its basal elasticity in perfect shape. If trauma or overuse alters its extracellular matrix, its ability to adapt correctly to these delicate stretches is reduced, resulting in inaccurate activation of muscle spindles and, subsequently, of the periarticular nociceptors.

Tensional compensation for a densified cc commonly extends along a mf sequence. It is, therefore, imperative to investigate previous and concomitant pain during our anamnesis in order to understand if a specific sequence is involved.

This text describes the unidirectional sequences of the upper and lower limbs, and the trunk, in a sequential manner in order to facilitate comprehension of this concept of continuity.

The sequence of retromotion (Fig. 1.13), situated

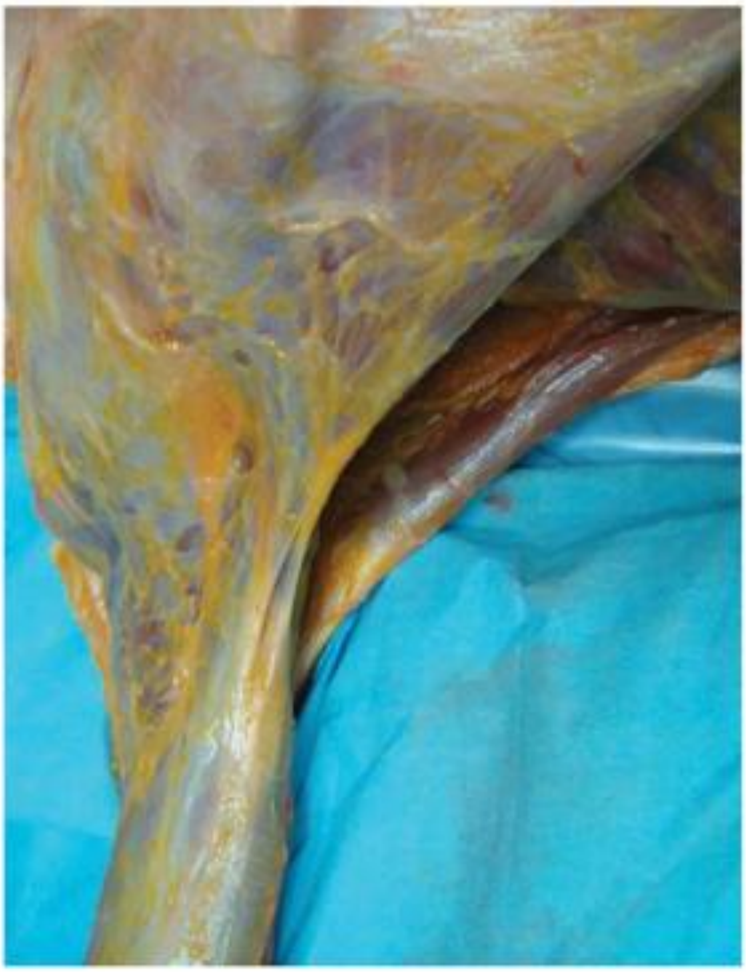

Fig.1.11. Tendinous expansion of latissimus dorsi onto posterior region of the brachial fascia.

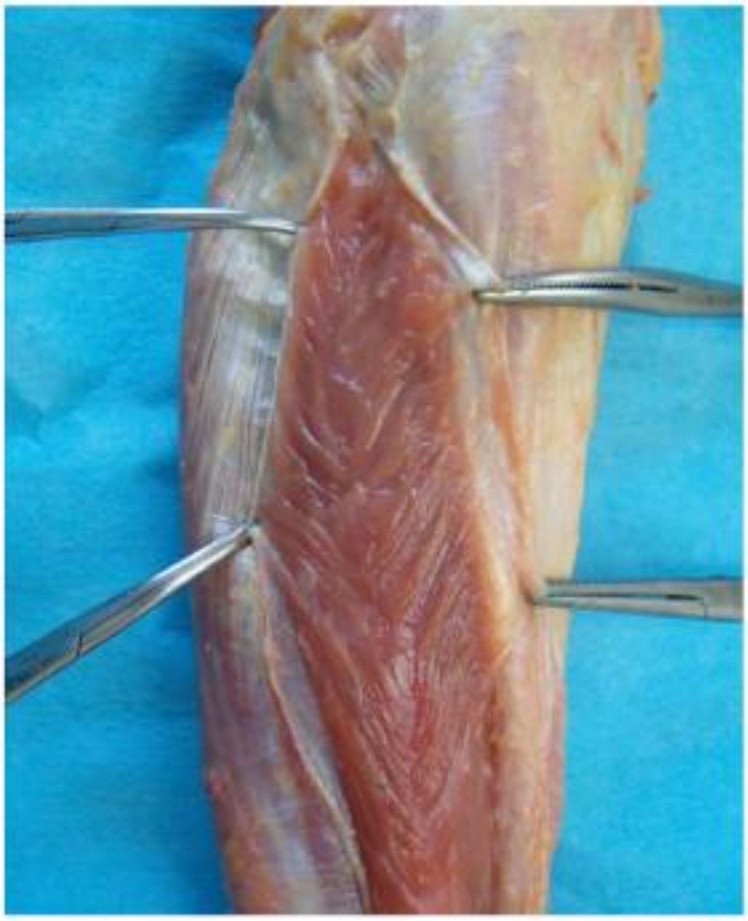

Fig.1.12. Antebrachial fascia, sectioned and stretched back to highlight origin of the extensor carpi ulnaris from the same fascia.

in the posterior region of the trunk and limbs, is the antagonist to the antemotion sequence. This association is useful for focusing our attention on the spatial planes. These two sequences form the agonist-antagonist mf forces that, together, control body posture on the sagittal plane.

An excessive tension in an ante mf unit often causes a counter-tension in a retro mf unit; this neutralises forces that could cause misalignment of the body segment.

Muscles comprising the retro sequence also extend tendinous expansions onto their overlying fascia. Anatomical texts describe these expansions without attributing them any physiological significance.

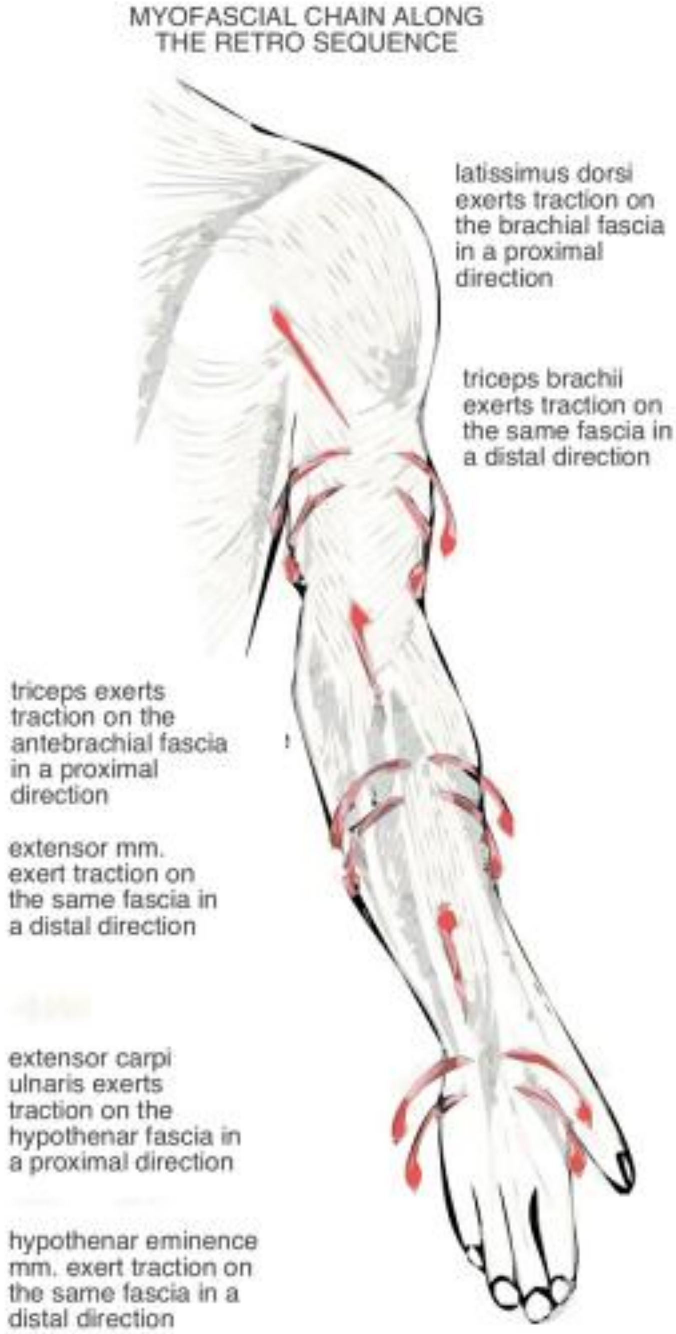

Fig.1.13. Mf sequence of retromotion in the upper limb.

For example, latissimus dorsi extends a tendinous expansion onto the posterior brachial fascia (Fig.1.11); this expansion stretches the two intermuscular septa in a proximal direction. Both the medial and lateral heads of triceps brachii take origin from these septa.

Contraction of triceps brachii causes simultaneous elbow extension, via its tendon inserted onto the olecranon, and stretch of the posterior antebrachial fascia, via a tendinous expansion onto this same fascia

Many muscular fibres of extensor carpi ulnaris take origin from the posterior antebrachial fascia (Fig. 1.12). Passive stretch of the muscle spindles can activate these fibres. This reciprocal, tensional interplay between unidirectional mf units could justify the presence of muscle spindles. In fact, cartilaginous fish have absolutely no spindles, yet, all the same, their muscles contract. The muscles of the various metameres in these fish insert onto myosepta (fascia), ensuring their synchronisation by uniting them into a single mf unit of lateromotion.

The latero and medio sequences in the limbs also have muscular fibres that insert onto the fascia. Similar to the sagittal plane, these fibres can tension the fascia in a proximal and a distal direction. The wide variety of limb movements has created a web of collagen fibres within the deep fascia:

- horizontal fibres, formed in response to traction exerted by segmental muscular fibres (mf unit);
- longitudinal fibres, formed in response to traction between diverse myofascial units (mf sequence);
- oblique fibres, formed in response to traction caused by complex or global movements (mf spirals).

The deep fascia of the trunk doubles to surround the diverse myofascial sequences:

- two longitudinal compartments comprise the ante sequence (rectus abdominal muscles) and the retro sequence (paravertebral muscles);
- the lateromotion sequence on one side is antagonist to the controlateral sequence; the medio sequence has only a perceptive role;
- the rotation sequences are united by the fasciae of the serrati and the obliques; the spirals are connected via the large, superficial muscles.

(humerus: hu, cubitus: cu, carpus: ca etc) and, subsequently, for the mf units (an-hu, re-ca, etc). We recommend using these abbreviations as it can facilitate the identification of the mf unit requiring treatment.

The exact location (loc) of the joint pain is defined: in the lateral part (la), anterior part (an), posterior part (re), or medial part (me) etc. It is then indicated if the pain is in the right (rt) or left (lt) limb/trunk or bilaterally (bi). Often the localisation of pain (la, an, re…etc.) can correspond to the painful movement (PaMo).

The chronicity (chron), or length of time the problem has been present, is then recorded. Pain present only for a few days (d), two or three weeks (w) or a less than 3 months (m), is considered as acute. If it has been present for more than 3 months or for years (y) then it is considered chronic. Chronic pain often presents a recurrent pattern (rec), with periods of remission and exacerbation. In the case of recurrent pain, it is useful to record the frequency: once a week (1xw), twice a month (2xm), three times a year (3xy). This data is helpful because reduction in frequency can signify an improvement. For example, if after treatment, the patient refers that their cephalalgia, previously occurring twice a week (2xw), presents itself only once in a month (1xm), then this is an indication that treatment has been effectuated in the correct point.

The last section of data, referring to the intensity of the pain (int), is quantified using asterisks: * slight pain arising during heavy work strain or sport; ** strong pain that does not, however, interrupt daily activity; *** very strong pain that does not allow normal daily activities (Fig. 2.2).

Having completed this part of the subjective examination, any known movement that aggravates the pain (PaMo) is also recorded. Patient's rarely report unidirectional movements as their major pain source, but commonly indicate complex movements or gestures. Subsequent movement verifications will identify individual, exacerbating movements. Even if the patient reports a complex movement, it can still be useful, in association with other data, in identifying a dysfunctional mf unit.

At times, there is no painful movement or, on the contrary, all movements are painful. In these cases, instead of the painful movement (PaMo), we can record any evident, symptomatic alterations reported by the patient or observed by the therapist, such as:

1. inflammation: this normally localises in the site of pain, that is, around the joint;
2. oedema: quantifiable by measuring circumference of the joint

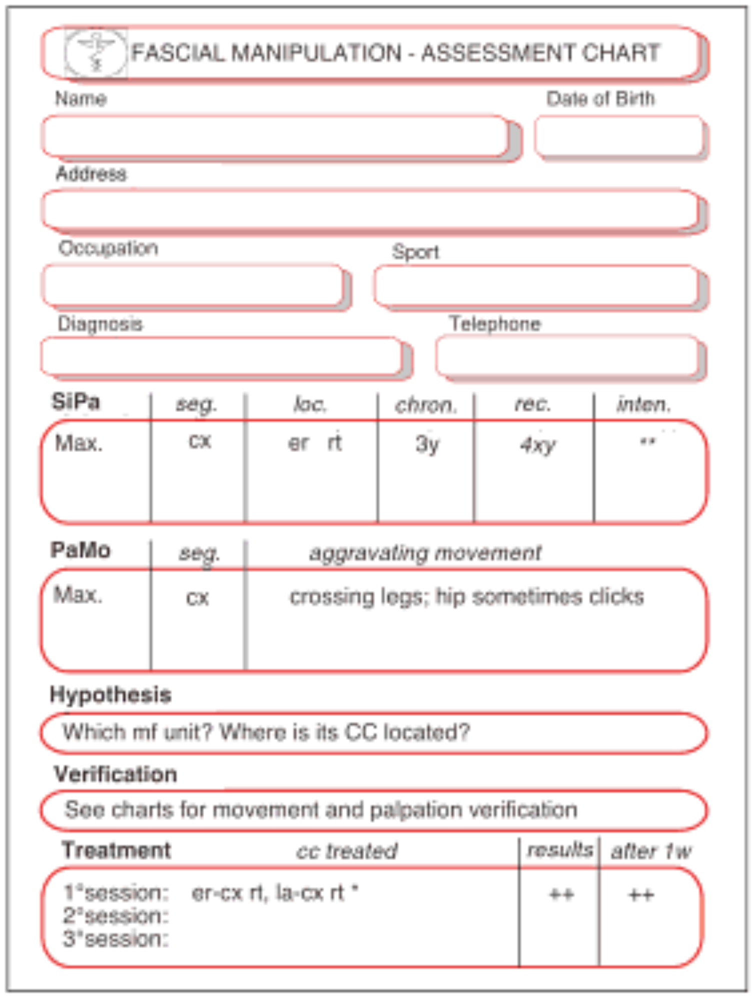

Fig. 2. 2. Example of compilation of an assessment chart for isolated hip pain (segmental disturbance).

3. cysts: these often develop over a specific tendon to compensate for incongruous muscular activity;
4. hypertonicity: hypertonicity and hypertrophy may develop to compensate a fascial alteration;
5. hypotonicity: often hypotonicity and hypotrophy in muscles are consequences of nerve irritation;
6. clicks: clicks, for example in the TMJ or knee joint during movement, indicate a tensional imbalance;
7. partial dislocation: small subluxations during movement can indicate an alteration in a mf unit;
8. paraesthesia: anomalous sensation in a cutaneous area due to a neuro-fascial compression;
9. posture (ptr): misalignment of the body can indicate a compensation for a disturbed mf unit;
10. deformation: every chronic misalignment that causes bony deformation indicates an adaptation of the bone to a persistent traction.

This information is necessary to quantify the results, which are not always immediately evident but can consolidate after one week.

Hypothesis

Prior to commencing, we need to establish a therapeutic plan based on the anamnesis and the subjective examination.

The recorded data can indicate two possible hypotheses:

- segmental: in this case, pain is localised in a single segment, and so, from the site of pain and the painful movement, we can deduce the potentially dysfunctional mf unit. We can then distinguish the exact altered centre of coordination by palpation.
- global: in this case, pain is located in numerous segments, and so, we can hypothesise the involvement of a spatial plane on which the different compensations have developed.

In both cases, before commencing treatment we will need to confirm our hypothesis via the movement verification (MoVe) and the palpation verification (PaVe).

Verification

Movement verifications or tests are proposed for each mf unit. These are not the same as single muscle tests. All of our muscles participate in a wide variety of movements, whereas a mf unit is responsible for the execution of a single movement of a single joint in a specific direction. A mf unit utilises monoarticular and biarticular fibres situated in different muscles and is never composed of just one muscle.

Each joint is governed by:

- six segmental myofascial units: two for the sagittal plane (ante-retro), two for the frontal plane (medio-latero) and two for the horizontal plane (intra-extra) (see summary tables);
- four mf units of fusion, involved in intermediate movements: ante-latero, ante-medio, retro-latero, and retro-medio (these mf units of fusion are discussed in the second part of this text)

The **movement** verification is designed to highlight the compromised mf unit. It is therefore necessary to examine the movements of the ailing joint in the three spatial planes

The movement verification can be carried out:

- passively: the therapist moves the joint passively in the three planes noting the most limited movement (joint range can be measured with a goniometer before and after treatment);
- actively: the patient moves the implicated segment or segments in the three planes and refers which direction aggravates the pain (pain can be measured using an algometric or Vas scale);
- against resistance: the fascial therapist applies resistance as the patient executes the previous movements. Where possible, apply resistance comparatively to two limbs to test any differences (force can be measured using a dynamometer before and after treatment).

Tab. 2.1. Grid for movement verification of a single segment

Frontal Plane	Sagittal Plane	Horizontal Plane
me-cx	an-cx	ir-cx*
la-cx	re-cx	er-cx***

Initially, it is best to record movements on a grid, facilitating comparison of impaired movements (Tab. 2.1). With acquired experience, this step can be done mentally.

For the **segmental** movement verification, the mobility of only one segment is examined in all of the three planes. The painful direction is noted using from one to three asterisks, according to the degree of pain, limited movement, or weakness. The unimpeded, non-painful directions can be annotated either without adding any asterisks, or else, not noted at all and then it is implied that they have been tested and were insignificant. For example, the movement verification for the coxa segment (cx) may evidence aggravation of pain on the horizontal plane (er-cx ***, ir-cx *). In the following grid, it can be deduced that the cc that requires careful attention during palpation verification is that of extra-coxa

The **palpation verification** should be carried out, in a comparative manner, over the cc of those mf units that were highlighted during the movement verification. In the aforementioned case, palpation of the cc of er-cx and ir-cx is indicated. Often only one of the two will present a definite alteration of the fascial tissue (Tab. 2.2).

Tab. 2.2. Grid for the segmental palpation verification

Frontal Plane	Sagittal Plane	Horizontal Plane
me-cx	an-cx	ir-cx
la-cx	re-cx	er-cx**

The palpation verification is carried out over the centre of coordination (cc) of each mf unit, considered the origin of the symptoms. This point does not normally manifest spontaneous pain itself. It is only painful when it is compressed. Hence, in order to be able to verify any alterations in the tissue, it is important to know the precise location of each different cc. Patients are often surprised when the therapist is interested in palpating a point at quite a distance from where they are feeling their pain (cp). At times, it can be useful to palpate the centre of perception, if only to be able to quantify any changes in local sensitivity before and after treatment.

Palpation of an active cc usually highlights two types of tissue alteration:

- a sense of "roughness" in the connective tissue (fascia);
- the presence of tight or contracted muscle fibres.

This alteration or "roughness" of the fascia forms due to trauma, overuse (postural or occupational), over-stretch, and strains; the muscular contraction forms due to changes in the alpha-gamma circuit. In the acute phase, for example during an attack of acute lumbago, muscular contracture is more evident, whereas in the chronic phase, fascial alteration is more evident. Whenever a cc presents muscle contracture and fascial alterations, the aim of treatment is always to liquefy the fascia, rather than to release the contracture. Once the fascial afferents are normal, that is, no longer nociceptive, then muscle tone normalises itself.

During palpation verification, we consider one objective factor, as perceived by the therapist, and three subjective factors, as referred to by the patient. In the first case, the therapist searches the area for an alteration in the tissue. This manifests itself as granular tissue, perhaps producing a "creaking" sensation, and it resists tissue mobilization like a taut cord (Hammer WI, 2005). Instead, the patient is asked to refer:

1. when palpation has centred the point of maximum sensitivity. In practice, this is actually the simplest way to define the point to be treated. A jump sign is often absent and so we rely on the patient's sensations to guide us;
2. when palpation triggers a needle-type sensation; this is preferable to a sensation of only pain or strong pressure;
3. when palpation provokes a referred pain; generally, this does not manifest immediately, but after a few minutes of manipulation.

Treatment

Treatment is always aimed at precise points of the fascia. Only manipulation of a limited area will transform friction into heat, modifying the consistency of the fascia's extracellular matrix, which is heat sensitive. In fact, any given pressure has a deeper, more intense action when the area of manipulation is reduced. The direction of manipulation is also important. It is regulated by the need to create the maximum friction against the fascia to develop the maximum heat in the minimum amount of time. Between two to ten minutes of manipulation are required to develop the necessary degree of heat. This variability in time depends on the chronicity of the fascial fibrosis and its consistency.

Fascial manipulation acts on different tissues:

- it mobilises the hypodermis or the subcutaneous loose connective tissue;
- it modifies the consistency of the deep fascia's extracellular matrix;
- it restores gliding between the endofascial collagen fibres;
- it ruptures adhesions between the layers of deep fascia in the trunk;
- it recreates elasticity of the connective tissue skeleton (epimysium, endomysium)

In this book, all of the photographs that depict treatment demonstrate the suggested treatment position for both the patient and the therapist.

In these photographs, treatment is often shown as performed with the knuckles, in order to highlight the exact localisation of each point. In order to complete a lengthy manipulation without tiring oneself we suggest using one's elbow whenever possible.

When necessary, the suggested patient position is adapted to an individual patient's situation (e.g. pregnancy or any particular difficulty in assuming the position). The fascial therapist should always assume the most comfortable working position possible, partially distributing weight onto the non-working arm, and dosing the amount of pressure applied to the treated point during manipulation.

Results

After every treatment, record each cc manipulated and the outcome; for example, if the cc of extra-coxa rt has been treated in one session with an immediate, positive outcome in terms of symptoms, then it is recorded on the assessment chart as follows: er-cx rt ++; if latero-coxa was treated in the same session without producing any results it is still recorded on the assessment chart to avoid repeating treatment of this point in subsequent sessions. If, for example, treatment of latero-coxa had actually worsened the patient's symptoms then an asterisk is added to indicate this, whereas if its treatment had produced no change then the cc alone is recorded (Fig. 2.2).

This immediate post-treatment evaluation, as well as that effectuated after one week, will influence the choice of points to treat in the subsequent sessions.

It is always wise to attend one week before making a second treatment. This allows the tissues enough time to respond and adjust to the manipulative stimuli.

On the patient's return, we enquire about their reaction to the manipulation and record the outcome on the assessment chart, once again using symbols (Tab. 2.3); in the section "results 1w", we record one, two or three plus signs if the outcome is positive(+++). If the benefit was immediate but it lasted only one day, the problem then returning as before, we record (+*). In the first case, the etiopathogenesis of the pain had been correctly approached. In the second case, treatment had been directed only to the antalgic contracture and not to the cause, that is, the fascial alteration.

Tab. 2.3. Symbols used to quantify results

Sym	Meaning	Indications
++	Immediately better, also in following days	Continue to treat cc's on the same plane
*++	Immediately worse, then much better	Post treatment inflammation eccessive
+	Slightly better, less than 50%	Segmental treatment but not global
+*	Immediately better, but then returned the same	Only release of muscular contraction
??	Pain location has changed	Treatment has created a compensation rather than a balance
**	Symptoms worse than before treatment	Maybe treated only consequence, not cause

Problems that may arise after treatment

The patient must feel better immediately after treatment. If not, then either the wrong point has been treated or the point "responsible" for the dysfunction has not been manipulated sufficiently. Within a few minutes after treatment, an inflammatory reaction develops in and around the treated point. This is a necessary reaction, both for the metabolism of the manipulated tissues and for an optimal repair of the fascia. At times, this inflammation accentuates symptoms for about two days before a more lasting improvement consolidates (*++).

If a patient refers that their symptoms have remained unchanged (+*), then we need to doubt our treatment choices, repeating the anamnesis and the verifications more accurately.

Small hematomas limited to specific areas may develop in subjects with particularly fragile capillaries. These tend to reabsorb spontaneously within a few days.

Small, superficial skin abrasions can occur if, during treatment, the fascial therapist slides over the patient's skin instead of adhering to it correctly.

B - Compilation of an assessment chart for global treatments

By practicing segmental manipulation for a certain period, the more experienced fascial therapist will notice that pain is often present simultaneously in more than one area, and that its distribution is not altogether casual. It often extends along precise mf sequences or is distributed over one plane.

Data

Record the different pathologies and musculoskeletal dysfunctions, which patients report during the anamnesis, in a concise and chronological order. This helps to formulate connections between what, at first, can appear to be apparently disconnected events. This is an essential ingredient for the elaboration of a successful treatment plan.

Firstly, we need to determine if the concomitant pain (PaConc) and the maximum pain (PaMax) are distributed on the same plane.

By means of an attentive analysis of the chronology of the different disturbances, we can elaborate the route that the various compensatory tensions may have developed over time.

Lastly, we consider any paraesthesia present in the hands, feet, or head, because fascial limitations often find their final compensation in the extremities.

Site of Pain (SiPa)

Under the section "SiPa", we record the current reason for which the patient is seeking treatment or, in other words, the maximum pain (PaMax). This is the same praxis already described in the compilation of a segmental assessment chart (Fig. 2.3).

together with lumbar pain, due to incoordination between the forces of extrarotation lumbi to the right and intrarotation lumbi to the left.

Reciprocal tensional equilibrium between agonist and antagonist muscles is fundamental on all planes. For example, rectus abdominis (an-lu) must be in tensional balance not only with the paravertebral muscles (re-lu), but also with rectus femoris (an-ge) and this, in turn, with the hamstrings (re-ta). Excessive tension in rectus femoris inclines the pelvis anteriorly on the sagittal plane, resulting in a hyperlordosis and contraction of the paravertebral muscles (re-lu).

Fascial Manipulation: indications and contraindications

Medical practitioners and patients alike often enquire about the indications or contraindications of fascial manipulation concerning a whole variety of disturbances.

In fact, the **indications** for this method range from locomotor apparatus' dysfunctions to visceral dysfunctions. The term "dysfunction" is to be emphasised here because, while the fascia intervenes in the motor activity of both voluntary and involuntary muscles (Schleip R, 2006), it is not efficient in the case of structural alteration or permanent damage. This does not mean that fascial manipulation constitutes a palliative treatment. On the contrary, it is valid for many pain syndromes that would otherwise be treated only with analgesics. Pain is the body's way of communicating that a part is not functioning. If we do not intervene in this initial phase then the incorrect use of a joint, or an organ, evolves towards arthritis or tissue fibroses with damage that can then only be repaired surgically.

The principal **contraindication** for fascial manipulation is the insufficient preparation of the fascial therapist. If therapists are knowledgeable about anatomy then they know where and how to apply pressure appropriately to avoid injuring nerves and vessels. When an inexperienced fascial therapist first approaches this type of treatment, as with any manual therapy, their tactile sensitivity is poorly developed and they tend to apply more pressure than is necessary. With practice it becomes clear that excessive pressure does not reduce treatment time. Once the correct point has been located, it is sufficient to apply the least amount of force necessary to engage the deep fascia, and to attend patiently for the sudden modification of the fascial tissue.

3

MYOFASCIAL SEQUENCE OF ANTEMOTION

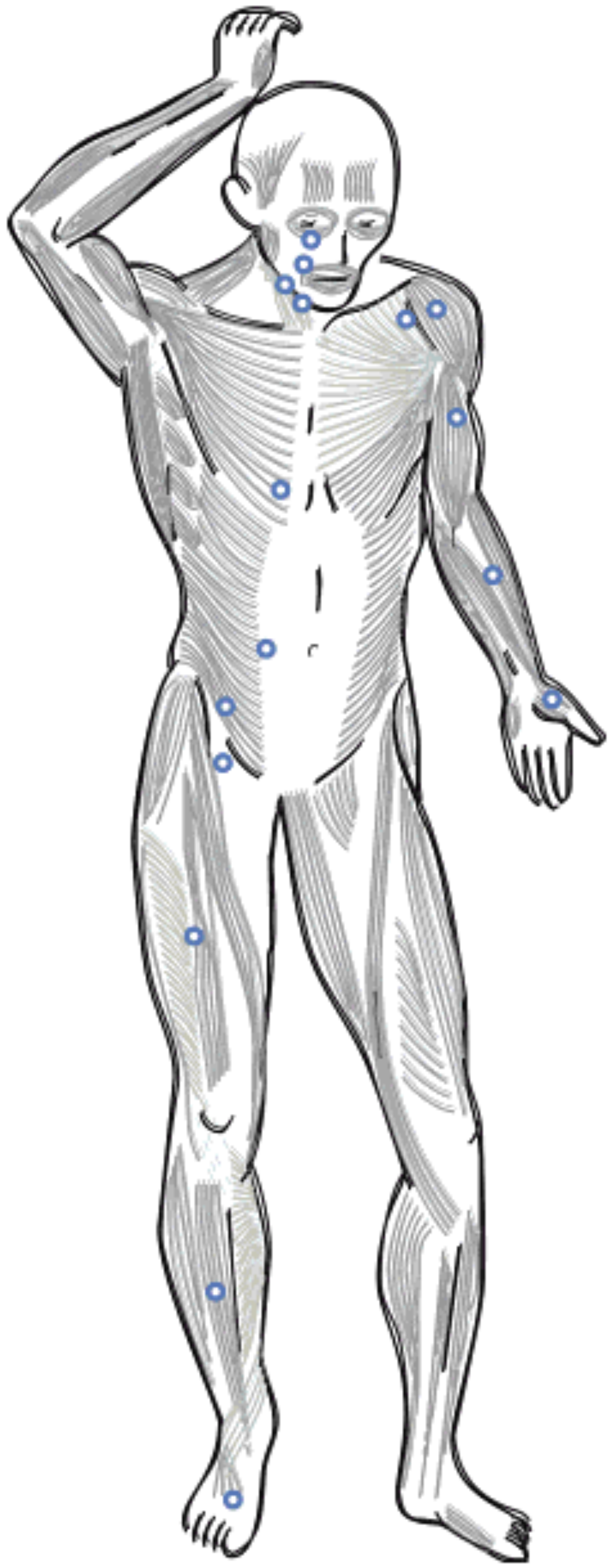

Fig. 3.1. CC of the antemotion sequence.

SAGITTAL PLANE

This mf sequence moves body segments forward and comprises the following mf units:

Trunk

ante-caput 1, 2, 3	an-cp 1, 2, 3
ante-collum	an-cl
ante-thorax	an-th
ante-lumbi	an-lu
ante-pelvis	an-pv

Upper limb

ante-scapula	an-sc
ante-humerus	an-hu
ante-cubitus	an-cu
ante-carpus	an-ca
ante-digiti	an-di

Lower limb

ante-coxa	an-cx
ante-genu	an-ge
ante-talus	an-ta
ante-pes	an-pe

CC of antemotion of the caput

Fig. 3.2. Lateral view of the head, after having retracted the skin inferiorly and the scalp superiorly.

The connective tissue structure is different in the various regions of the head: in the parotid region and the cheek, the superficial musculoaponeurotic system (SMAS or superficial fascia) is comprised between two layers of adipose tissue. Around the lips and the eyes, the superficial fascia unites with the deep muscular fascia. In the temple region, the superficial fascia (galea aponeurotica) is comprised between two layers of adipose tissue (innominate fascia), separating it from the overlying scalp and from the underlying temporal fascia.

CC of antemotion of the trunk

Fig. 3.3. Deep abdominal fascia united to the aponeurosis of the external oblique muscle.

The external oblique muscle presents as a uniform muscle, whereas fibre bundles with diverse orientations and separated by septa form the internal oblique and the transversus abdominis. Based on these morphological differences it is reasonable to hypothesise functional diversities.

NOTE: All of the anatomical photographs in this text are of cadavers that had not been embalmed or frozen prior to dissection.

CP and sites of pain of antemotion sequence in the head and trunk

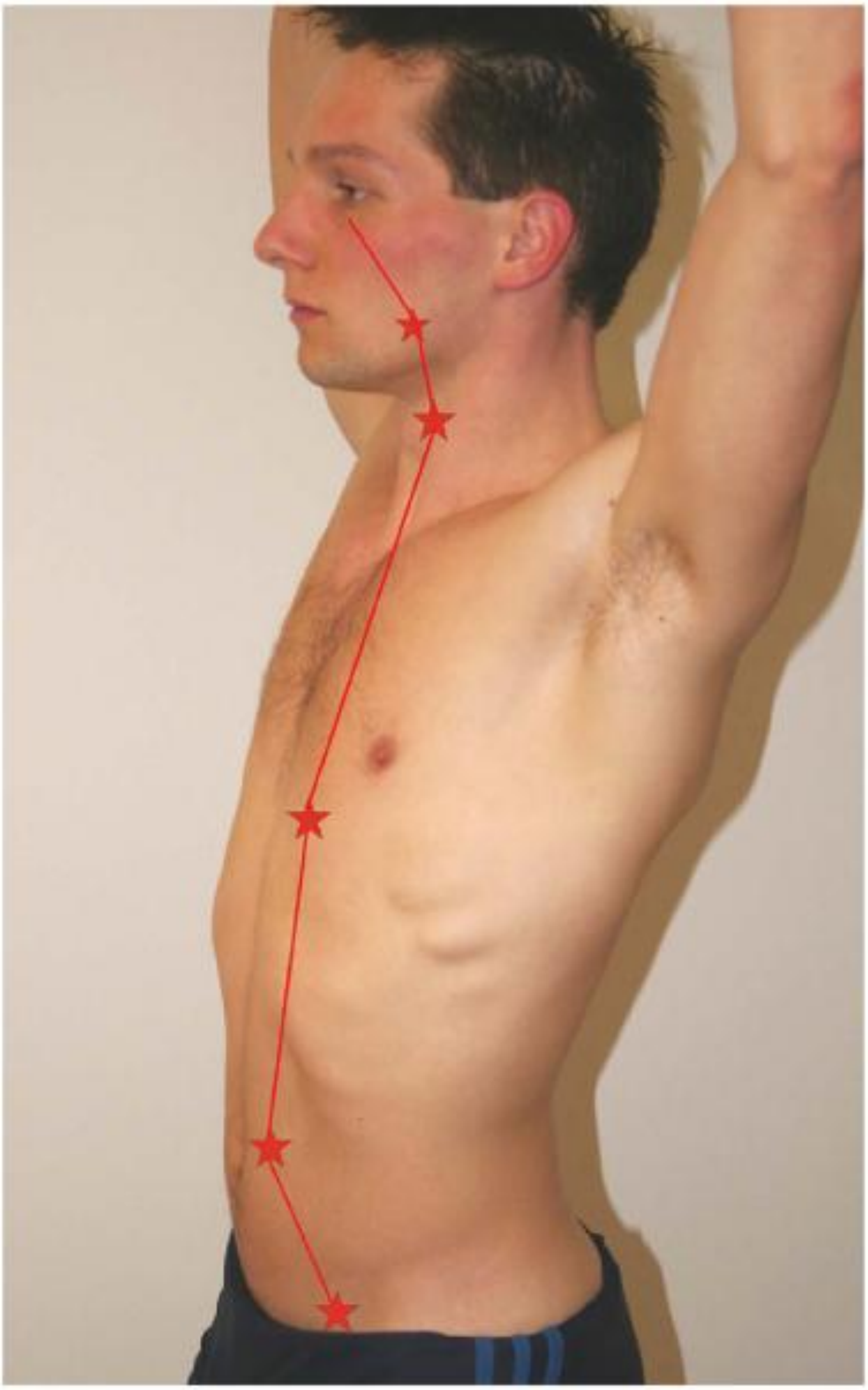

Fig. 3.4. Distribution of referred pain from antemotion cc(s).

The red stars indicate the centres of perception which, in case of dysfunction of a mf unit, correspond to the area where pain of the various segments (cp, cl, th, lu, pv) commonly manifests. The centres of perception of the trunk are near the centres of coordination. The red line follows the distribution of referred pain. At times, when treating the neck segment, the patient may feel pain refer to the mandible and the eye; at other times, when treating the cc of an-pv, the patient may feel referred pain extending towards the neck like a "tight cord".
In the sections regarding each single segment, relevant pathologies are reported in detail.

Mf unit of ante-caput 3 an-cp 3

Fig. 3.11. Site of pain and its origin.

Site of pain or CP:
in the temporomandibular joint. Can be pain, or only click, on opening mouth.

Origin of dysfunction or CC:
lack of coordination between masseter and digastric muscles due to fascial alteration or rigidity.

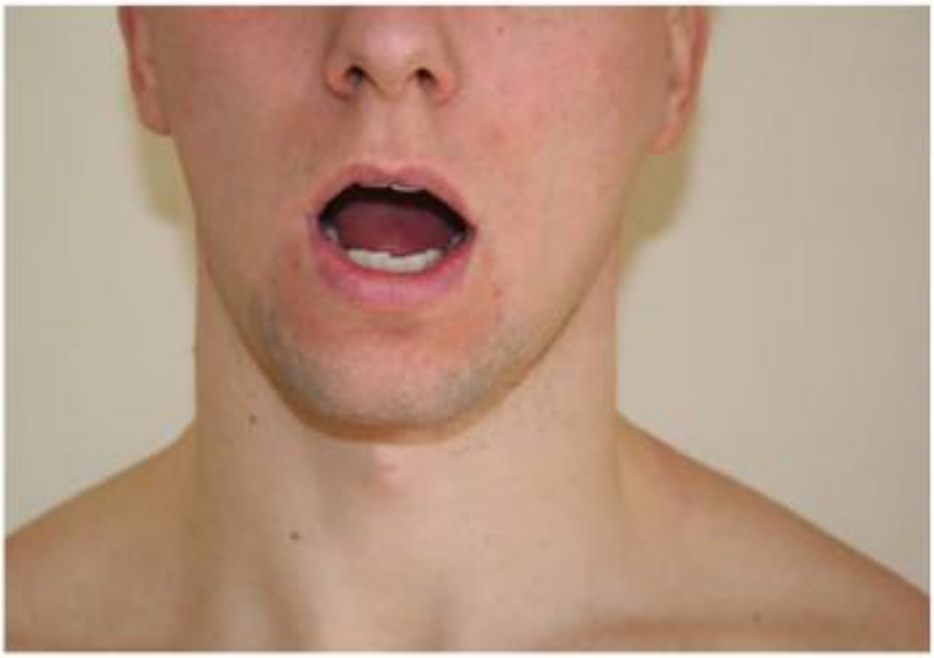

Fig. 3.12. Movement verification.

Ask patient to open their mouth and note any deviations of the mandible. There can be limited jaw opening due to rigidity of the masseter muscle or deficit of digastric muscle

Fig. 3.13. Treatment.

Patient supine; therapist uses fingertips of index and middle fingers over anterior portion of digastric muscle, below inferior border of the body of the mandible.

Mf unit of ante-collum

an-cl

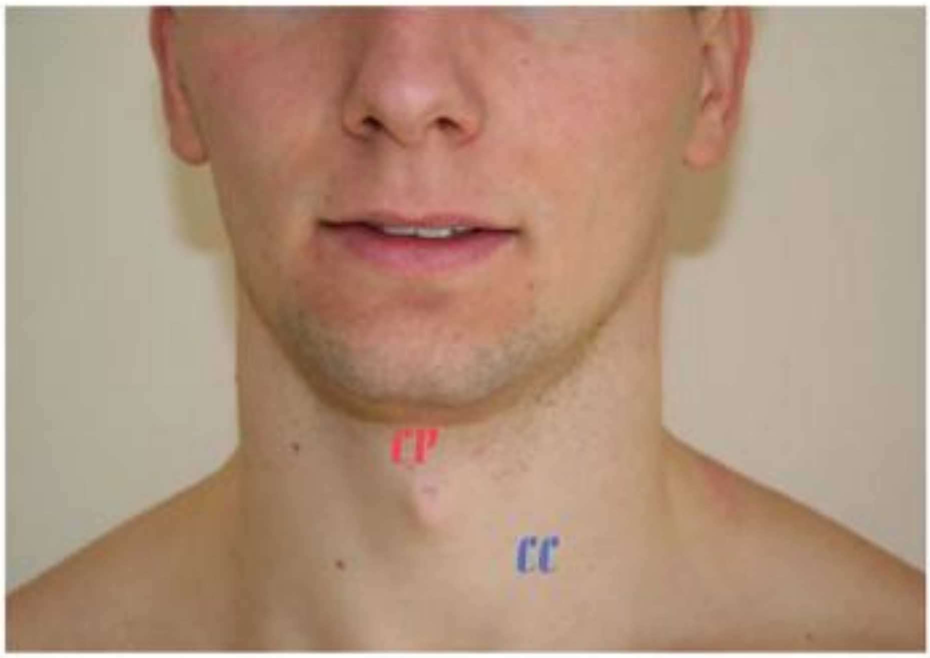

Fig. 3.14. Site of pain and its origin.

Site of pain or CP:
patient complains of pain in anterior neck region (agonist muscles) or in posterior region (antagonist mf unit).

Origin of dysfunction or CC:
as the vertebrae are the only fulcrum on which all muscles of the neck act, then an anterior fascial alteration can cause pain in the posterior neck region.

Fig. 3.15. Movement verification.

Pain accentuates when the patient lifts their head from supine position. In standing, patient may have difficulty looking downwards or bending neck forward e.g. chin to sternum.

Fig. 3.16. Treatment.

Patient supine; therapist palpates fascia over anterior border of sternocleidomastoid muscle at the level of the thyroid cartilage. Having identified the densified area treatment is carried out with knuckle or fingertip.

Mf unit of ante-thorax **an-th**

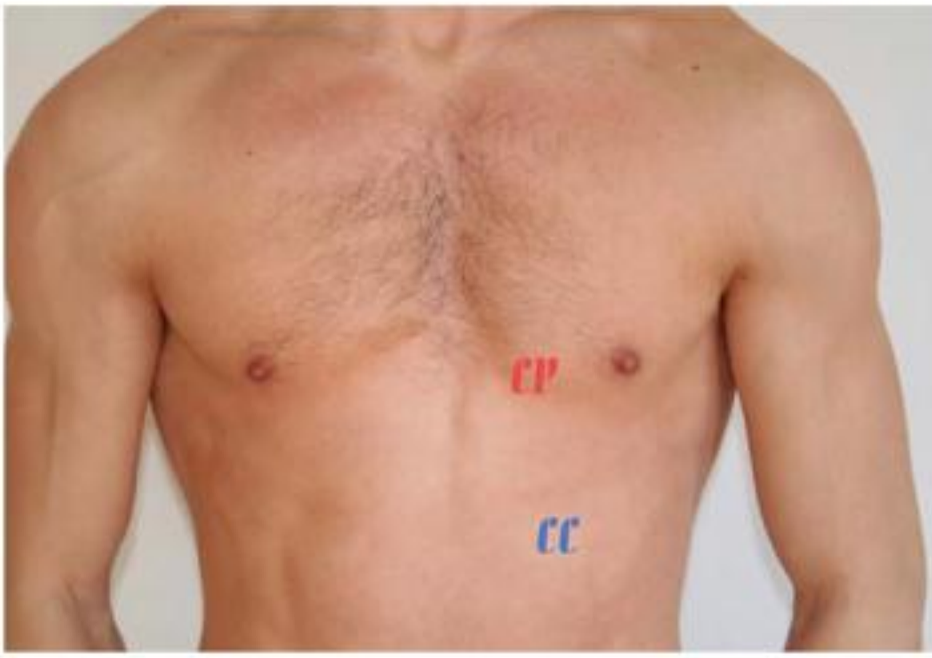

Fig. 3.17. Site of pain and its origin.

Site of pain or CP:
sense of oppression in the anterior chest, respiratory problems, anxiety.

Origin of dysfunction or CC:
in the point of the thoracic fascia where some pectoralis major fibres unite with the rectus abdominis sheath.

Fig. 3.18. Movement verification.

Patient supine, hands behind head, lifts shoulders from table, to test thoracic insertion of rectus abdominis.

Fig. 3.19. Treatment.

Therapist uses knuckles of index and middle fingers against lower border of rib cage in the lateral region of rectus abdominis. In robust patients, it is possible to use the elbow for this CC.

Mf unit of ante-lumbi **an-lu**

Fig. 3.20. Site of pain and its origin.

Site of pain or CP:
anterior abdominal wall along rectus abdominis sheath; pain is related to excessive muscular stress. An anterior alteration may involve the vertebral column, causing posterior pain.

Origin or centre of coordination:
if the abdominal fascia is subjected to intense training it becomes less elastic, with repercussions to the muscular fibres.

Fig. 3.21. Movement verification.

Patient supine, attempts to raise head, thorax and legs simultaneously; it is difficult to test this mf unit in the standing position.

Fig. 3.22. Treatment.

According to patient's physique, the therapist uses knuckle or elbow against the rectus sheath, at the umbilicus level; referred pain may extend towards the pubis or towards the xyphoid process.

Mf unit of ante-pelvis an-pv

Fig. 3.23. Site of pain and its origin.

Site of pain or CP:
bilateral or unilateral sense of heaviness in the iliac fossa; pain may also refer to the anterior thigh or the sacrum region.

Origin or centre of coordination:
monoarticular fibres (iliacus) and biarticular fibres (psoas) unite in the iliac fossa.

Fig. 3.24. Movement verification.

Patient supine, legs flexed, raises one leg at a time. If no pain then raise both legs simultaneously, bringing knees up toward chest. Pain may manifest in the inguinal or the sacral region.

Fig. 3.25. Treatment.

Therapist places elbow or knuckle against medial part of the iliacus fascia, waiting for the abdominal wall to relax before beginning to manipulate deeply.

Mf unit of ante-coxa **an-cx**

Fig. 3.29. Site of pain and its origin.

Site of pain or CP:
pain in anterior thigh region that accentuates when lifting the leg, as in going up a step.

Origin or centre of coordination:
in the iliopectineus fascia that unites monoarticular (pectineus) and biarticular fibres (iliopsoas, sartorius).

Fig. 3.30. Movement verification.

Patient standing, vigorously swings leg forwards and backwards; pain may accentuate either during stretch of the muscular fibres (backwards movement) or on shortening (forwards).

Fig. 3.31. Treatment.

Patient supine, leg extended; therapist places knuckle medially to sartorius' sheath, below the inguinal ligament, creating friction against the iliopsoas fascia. Given the presence of lymphatic nodules and vessels in this region, do not protract treatment excessively.

Mf unit of ante-genu

an-ge

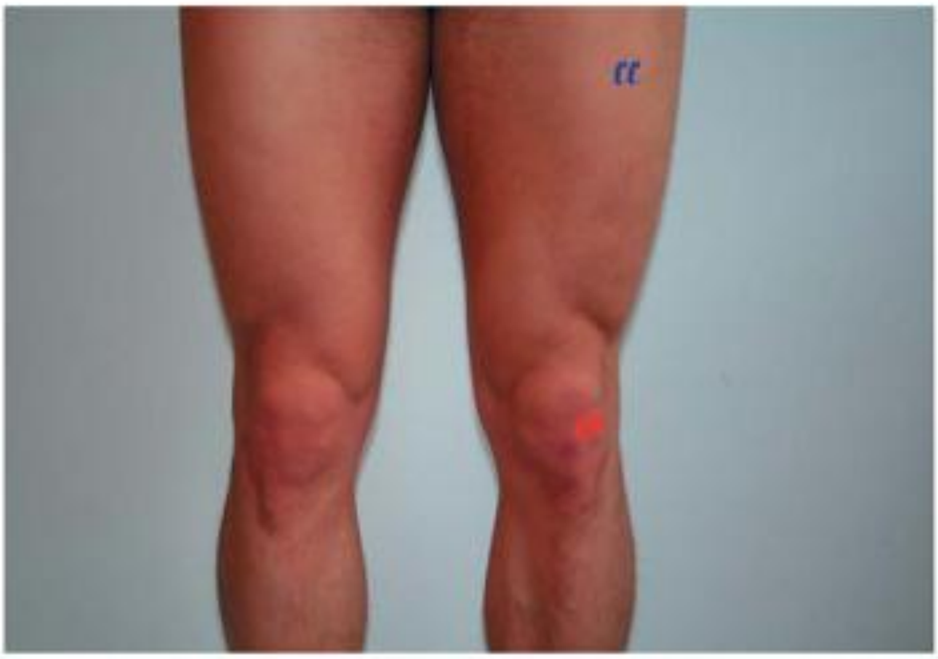

Fig. 3.32. Site of pain and its origin.

Site of pain or CP:
pain in anterior part of the knee (tendinitis, bursitis, chondromalacia patellae) that accentuates descending stairs or mountain; pain may be post-fracture or post-joint surgery.

Origin or centre of coordination:
even though pain is localised in the knee we need to refer to those muscles that move this joint forwards (ante).

Fig. 3.33. Movement verification.

Patient places full weight on one leg and, by bending the same knee (lunge), contracts the mf unit of ante-genu. Pain manifests in the patellar tendon (cp) but the origin lies in the fascia over the quadriceps (cc).

Fig. 3.34. Treatment.

The therapist places knuckle or elbow over the fascia lata, halfway between the patella and the inguinal ligament, lateral to the rectus femoris. Palpate for fascial alteration and the point that refers pain to the knee.

Mf unit of ante-talus

an-ta

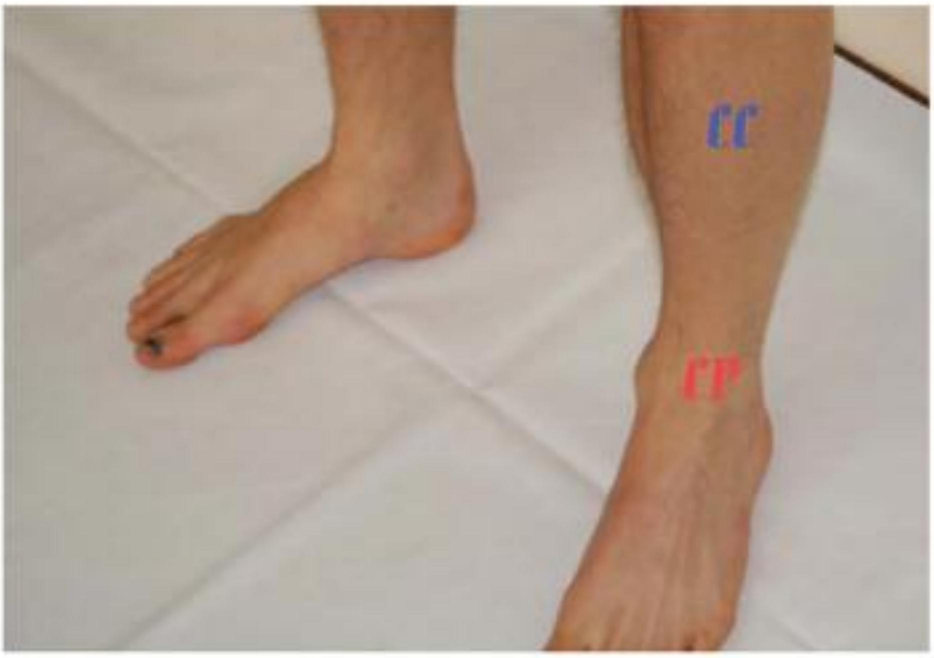

Fig. 3.35. Site of pain and its origin.

Site of pain or CP:
in the anterior region of the ankle (tendinitis of tibialis anterior or extensor digitorum), sprains or tibiotarsal joint fractures.

Origin or centre of coordination:
the extensor tensors become inflamed when the altered, overlying mf unit causes them to work in a non-physiological manner.

Fig. 3.36. Movement verification.

Ask patient to walk on tiptoes and then on their heels to verify if pain accentuates during active contraction (shortening) or stretch of the mf unit.

Fig. 3.37. Treatment.

Patient supine, leg extended; the therapist places their knuckle or elbow against the summit of the extensor compartment, halfway on the lower leg Pain often refers immediately to the symptomatic area (anterior ankle).

Mf unit of ante-pes

an-pe

Fig. 3.38. Site of pain and its origin.

Site of pain or CP:
in the metatarsophalangeal and interphalangeal joints of the first toe (hallux); possible tendinitis of the extensor hallucis longus or brevis.

Origin or centre of coordination:
in the dorsal fascia of the foot that unites the monoarticular (extensor brevis) and biarticular (extensor hallucis longus) muscle fibres.

Fig. 3.39. Movement verification.

Test simultaneously resisted extension of the two halluxes; sometimes pain is present, or weakness, or limited ROM, or paraesthesia.

Fig. 3.40. Treatment.

If weakness is prevalent, then treatment can extend to the lumbar region; if only local pain is present, then manipulation of the extensor brevis fascia of the I° toe, using the knuckle, can be sufficient.

CC of antemotion of the upper limb

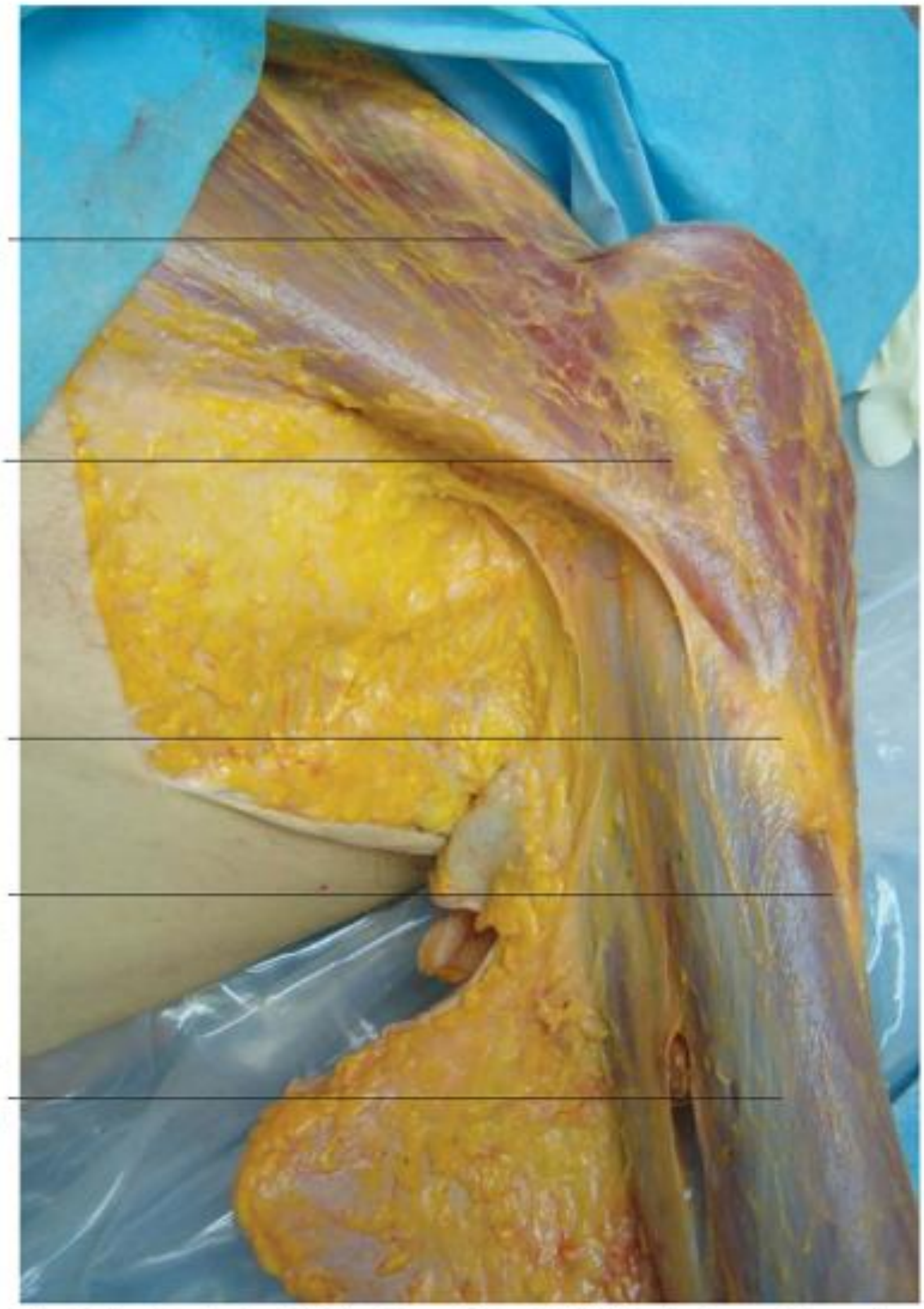

Fig. 3.41. Anterior brachial fascia united to deltoid fascia by a collagen fibre bridge, which corresponds to the point of insertion of pectoralis major onto the brachial fascia.

Mf unit of ante-scapula **an-sc**

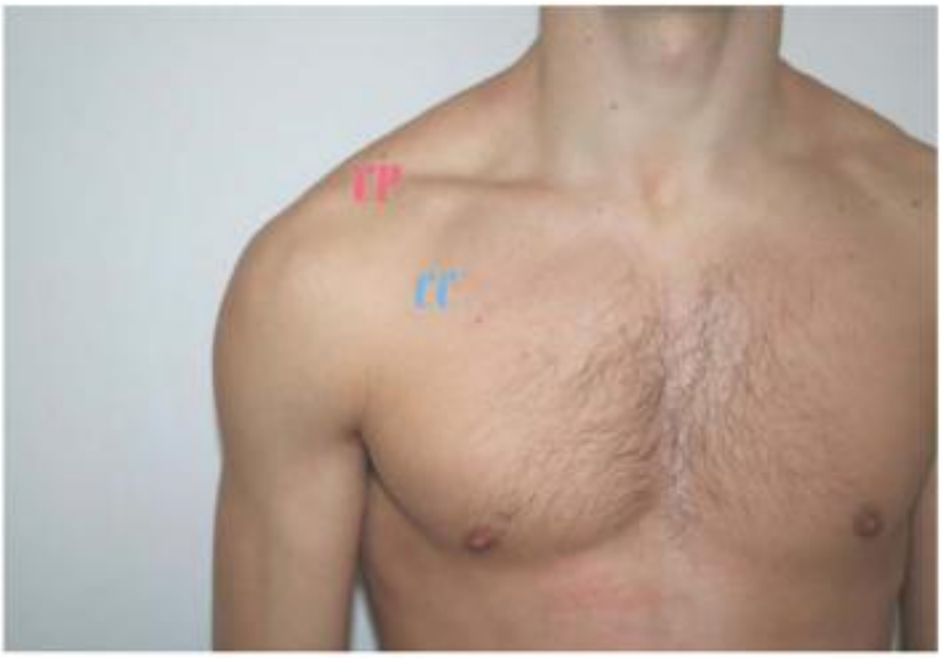

Fig. 3.44. Site of pain and its origin.

Site of pain or CP:
trauma or sprain in acromioclavicular joint; pectoralis minor syndrome, with brachial plexus irritation.

Origin of dysfunction or CC:
in the clavi-coraco-axillary fascia, that unites the monoarticular (pectoralis minor) and biarticular (pectoralis major) muscle fibres.

Fig. 3.45. Movement verification.

Ask patient to bring both shoulders forward and note any lack of symmetry between the two sides; alternatively, ask patient to push table forward with both arms (isometric shoulder flexion).

Fig. 3.46. Treatment.

Therapist uses knuckle or elbow to penetrate the sub-coracoid sulcus, manipulating the point of fascial alteration that refers pain.

Mf unit of ante-humerus an-hu

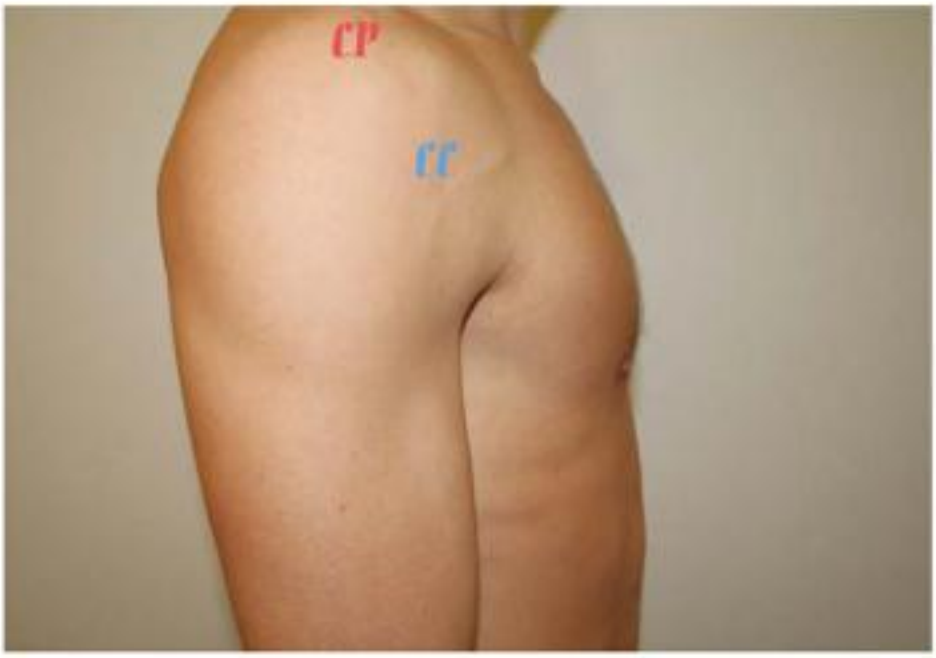

Fig. 3.47. Site of pain and its origin.

Site of pain or CP:
pain in the anterior region of the shoulder that accentuates during antemotion of the shoulder. A diagnosis of capsulitis is common in these cases.

Origin of dysfunction or CC:
due to lack of coordination of the mf unit, the humerus and scapula movements are asynchronous.

Fig. 3.48. Movement verification.

Ask patient to bring arm forward as in shaking hands. At times this is so painful the patient has to use the other hand to help with the movement.

Fig. 3.49. Treatment.

Patient supine, arm along side, the therapist uses their knuckle over anterior part of upper deltoid, searching for the most significant fascial alteration that refers pain.

Mf unit of ante-cubitus **an-cu**

Fig. 3.50. Site of pain and its origin.

Site of pain or CP:
limited ROM of the elbow, often painless, can occur following fractures or dislocation of the radial head.

Origin of dysfunction or CC:
in the densified brachial fascia that cannot synchronise the monoarticular (brachialis) and biarticular (biceps and brachioradialis) muscle fibres.

Fig. 3.51. Movement verification.

Either test comparatively resisted elbow flexion (bilaterally) or compare elbow flexion ROM by asking patient to touch both shoulders; measurement of the distance between the middle fingertip and the acromion, before and after treatment, can be useful.

Fig. 3.52. Treatment.

The therapist initially uses their knuckle to explore the brachial fascia over the biceps, at the level of the distal tendon of deltoid, then manipulates with the elbow. Often patients understand why manipulation is applied to an area distant from their symptoms only when they feel pain referring to their elbow.

Mf unit of ante-carpus

an-ca

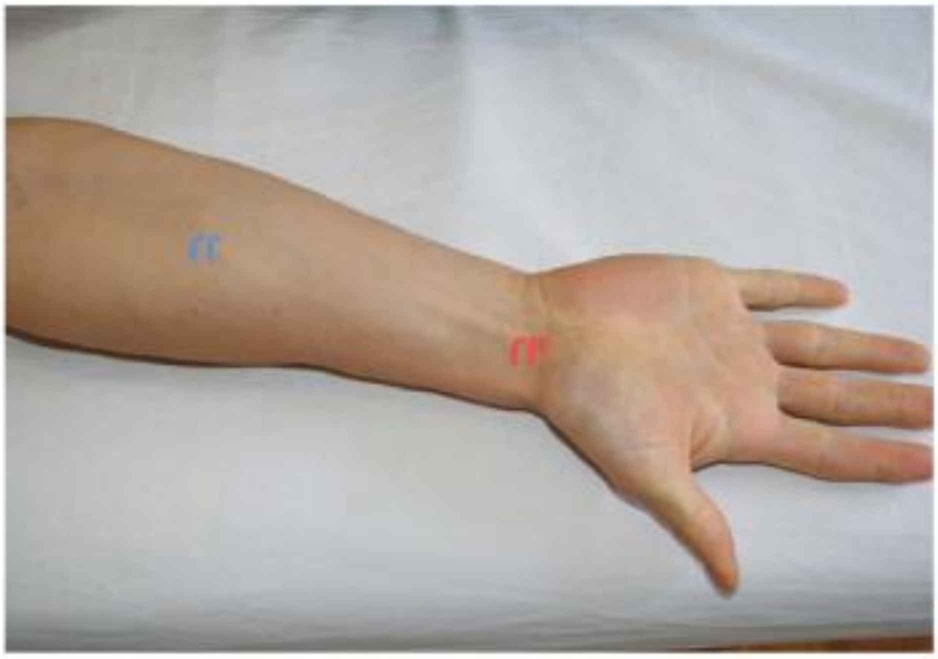

Fig. 3.53. Site of pain and its origin.

Site of pain or CP:
Along the flexor carpi radialis tendon - compensatory cysts may form here due to anomalous muscle tension; sometimes the patient complains of thumb pain, similar to writer's cramp.

Origin or centre of coordination:
in the antebrachial fascia, in the point where the monoarticular (flexor carpi radialis) and biarticular (flexor pollicis longus) muscle fibres unite.

Fig. 3.54. Movement verification.

Test force of flexor carpi radialis against resistance. Alternatively, ask patient to place both hands palms down on the table and then to push down forcefully - patient is asked to then indicate the most painful area (flexor carpi radialis tendon).

Fig. 3.55. Treatment.

Patient supine, therapist places knuckle, or elbow, over muscle belly of flexor carpi radialis to manipulate the antebrachial fascia. Here the fascial alteration is often chronic, requiring more time to dissolve; hence, use of the elbow is advisable.

Mf unit of ante-digiti **an-di**

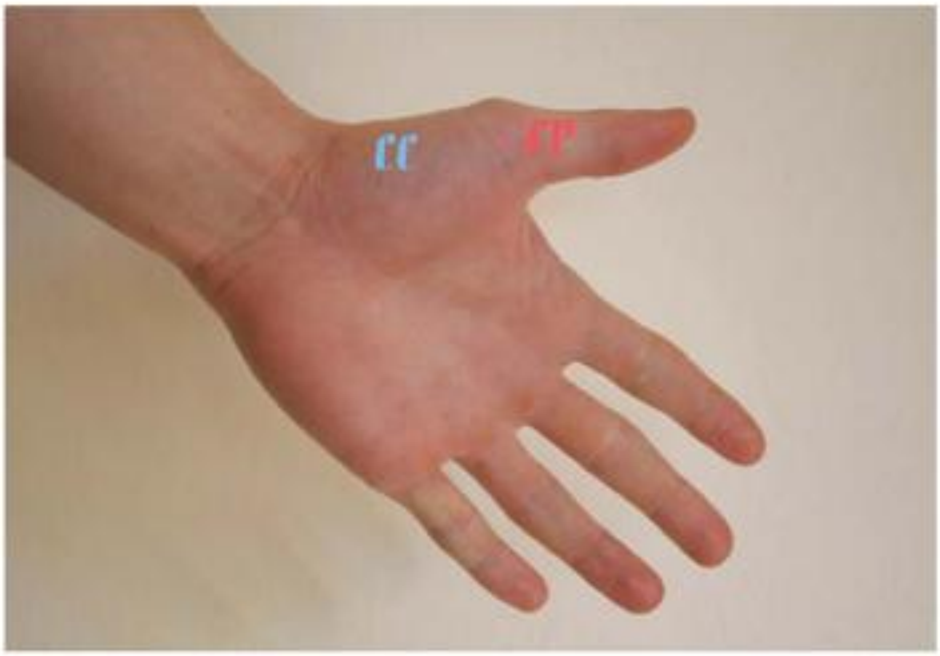

Fig. 3.56. Site of pain and its origin.

SSite of pain or CP:
the thenar eminence dysfunction manifests mostly in the first metacarpophalangeal joint but, due to fascial continuity, it may also involve the other metacarpophalangeal joints.

Origin or centre of coordination:
in the area of densified fascia that unites the monoarticular (flexor pollicis brevis) to the biarticular (flexor pollicis longus) muscle fibres.

Fig. 3.57. Movement verification.

Passive stretch of the thenar eminence provokes pain - often the patient inadvertently avoids this movement during daily living activities.

Fig. 3.58. Treatment.

Having identified the most densified point of the thenar eminence, the therapist uses the knuckle to manipulate this point until tissue fluidity is restored.

CC of retromotion of the head and neck

Fig. 4.2. Lateral part of head with the galea aponeurotica and the occipitalis muscle.

A layer of adipose tissue lies below the skin of the cranium and the neck. This facilitates gliding between the skin and the superficial fascia. In this photograph, the adipose layer has been removed together with the scalp. The occipitalis muscle, comprised within the superficial fascia, is visible in the occipital region.

CC of retromotion of the trunk

Fig. 4.3. Erector spinae muscles, left-side, after removal of thoracolumbar fascia, trapezius, rhomboids, and latissimus dorsi.

CP and sites of pain of retromotion sequence of head and trunk

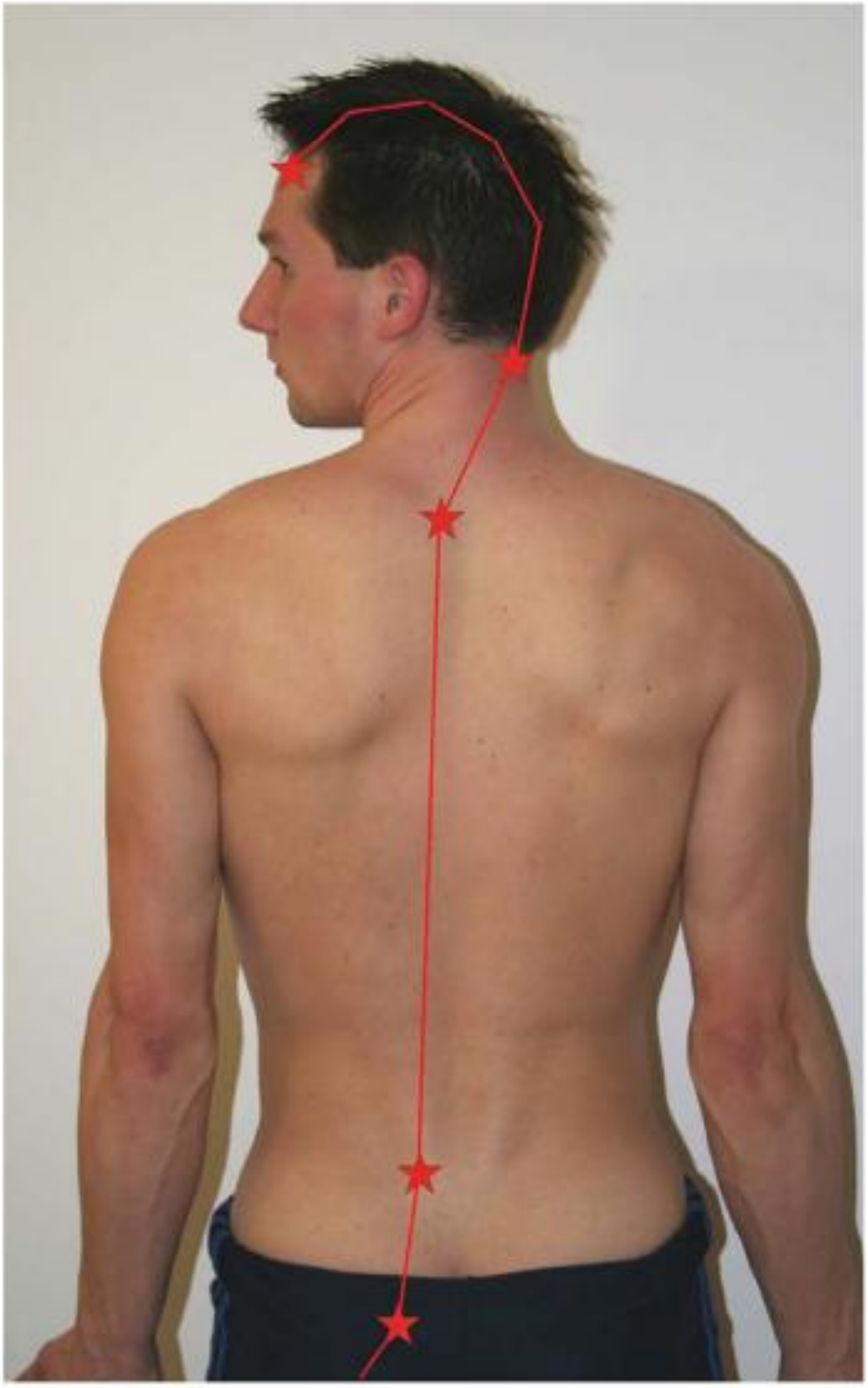

Fig. 4.4. Distribution of referred pain of retromotion cc(s).

The red stars indicate the more frequent sites of pain along the retromotion sequence. Even in presence of a diffuse pain along the entire back area, as indicated by the red line, the most painful areas are the cervicodorsal and lumbosacral junctions.

Mf unit of retro-caput 1 **re-cp 1**

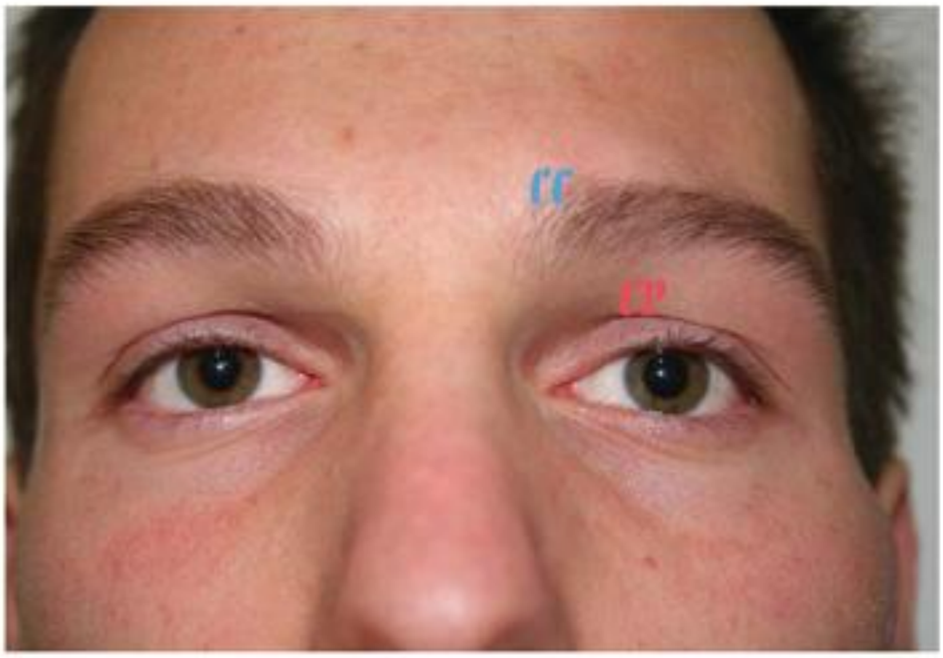

Fig. 4.5. Site of pain and its origin.

Site of pain or CP:
in the upper eyelid and the rectus superior muscle of the eye.

Origin of dysfunction or CC:
in the fascia bulbi or Tenon's capsule that unites the muscle fibres of rectus superior to the fibres of the upper eyelid and orbicularis oculi.

Fig. 4.6. Movement verification.

Ask patient to gaze upwards and verify any lack of symmetry between the two eyes or if any eyelid deficit accentuates.

Fig. 4.7. Treatment.

Patent supine, therapist places both index fingertips over internal border of eyebrows in order to palpate the two cc(s) comparatively. Treat only the densified cc that refers pain.

Mf unit of retro-caput 2

re-cp 2

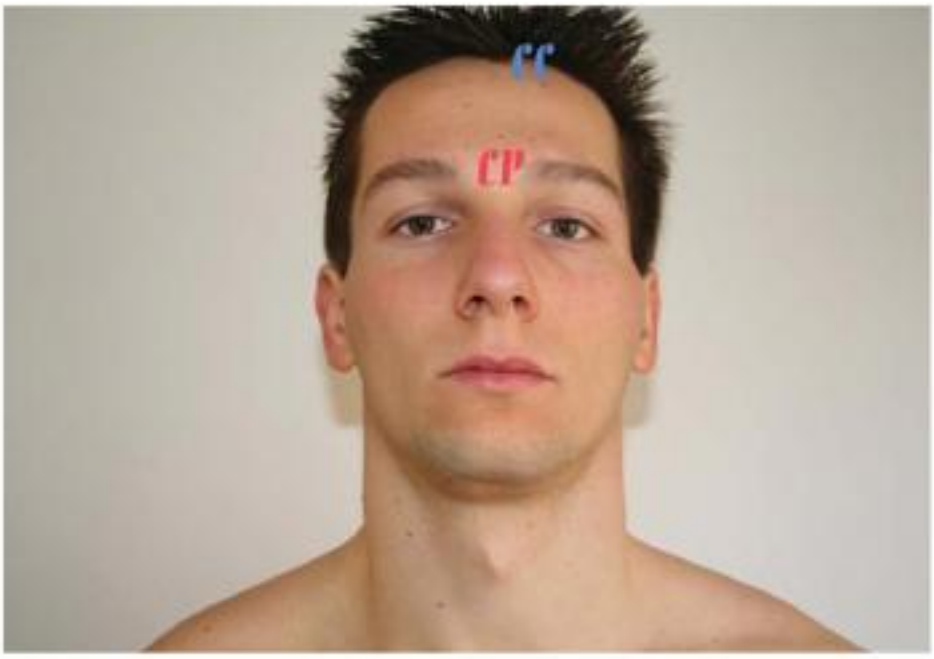

Fig. 4.8. Site of pain and its origin.

Site of pain or CP:
pain in frontal sinuses or more often the patient complains of having the sensation of a blocked nose.

Origin of dysfunction or CC:
in the forehead fascia that descends over the nose and connects to the cranial periosteum via numerous collagen fibres.

Fig. 4.9. Movement verification

Ask patient to wrinkle forehead to test tone of frontal muscles. Note any difference between the left and right sides.

Fig. 4.10. Treatment.

Patient supine, therapist treats the mf unit of re-cp 2 on the side that results more densified and painful, until symptoms abate.

Mf unit of retro-thorax re-th

Fig. 4.17. Site of pain and its origin.

Site of pain or CP:
the patient complains of painful shoulders but when asked to indicate the exact localisation of their pain it is actually in the upper thoracic vertebrae.

Origin of dysfunction or CC:
fascial alteration of the thoracic fascia at the fourth thoracic vertebra level is often the cause of upper thoracic vertebral conflict.

Fig. 4.18. Movement verification.

Ask the patient to hyperextend the dorsal region; often the rigidity of these vertebrae is such that moving the scapula closer together is the only movement possible, and the thoracic kyphosis is inalterable

Fig. 4.19. Treatment.

Patient in prone lying; the therapist uses elbow over the erector spinae muscle bulk at the level of the fourth thoracic vertebra, shifting the pressure slowly to identify the point that refers pain to the lumbar or nuchal regions.

Mf unit of retro-lumbi re-lu

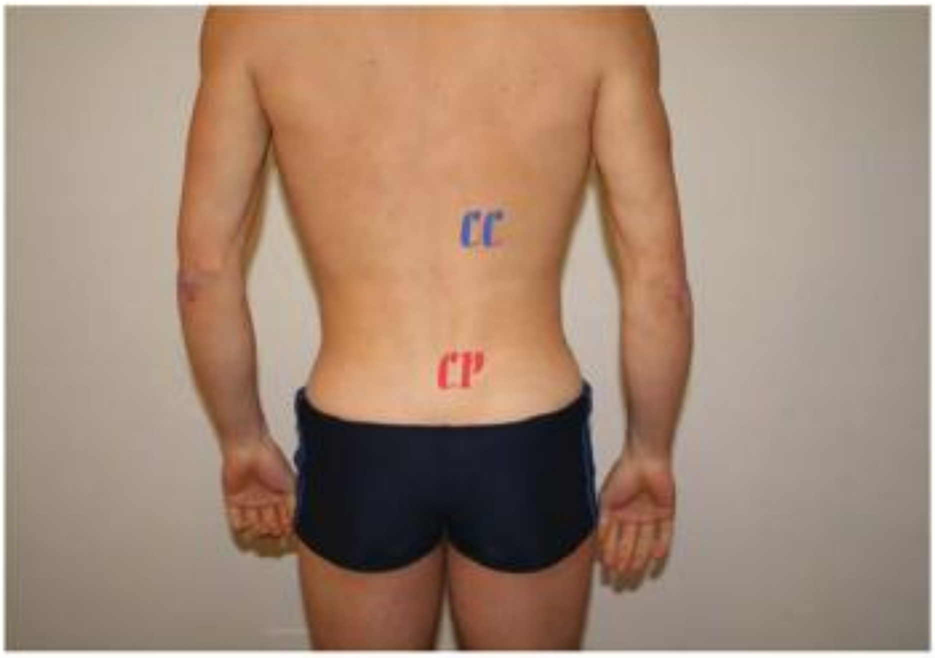

Fig. 4.20. Site of pain and its origin.

Site of pain or CP:
Acute or chronic lumbalgia with pain distributed in lumbosacral region, that is, in the region where the fascial imbalance manifests principally.

Origin of dysfunction or CC:
At the first lumbar level, where the erector spinae muscles are well developed.

Fig. 4.21. Movement verification.

Ask the patient to contract the erector spinae either by arching the back or by bending forwards. The arthro-myo-fascial imbalance can manifest itself either during concentric or eccentric muscle contraction.

Fig. 4.22. Treatment.

Patient prone, the therapist uses elbow over the erector spinae muscle mass at the first lumbar level, shifting pressure to find the point that refers pain to the sacral region. Palpate the opposite side to compare painfulness/alteration. If the fascial alteration is unilateral then treat only on that side.

Mf unit of retro-pelvis **re-pv**

Fig. 4.23. Site of pain and its origin.

Site of pain or CP:
if subjected to unbalanced strain the sacroiliac region may become inflamed on one or both sides, with local and/or referred pain.

Origin of dysfunction or CC:
this type of imbalance is mostly due to fibrosis of the iliolumbar ligament (CC), between the fifth lumbar vertebra and the posterior superior iliac spine.

Fig. 4.24. Movement verification.

This test is similar to that for the lumbar region but here sacroiliac mobility is accentuated by asking the patient to push their pelvis forwards with their hands.

Fig. 4.25. Treatment.

The therapist places their elbow in the sulcus between the fifth lumbar vertebra and the PSIS, waiting for the patient to relax, then slowly begins to manipulate the underlying collagen structures in a transverse direction.

CC of retromotion of the lower limb

Fig. 4.26. Deep fascia of the posterior region of the thigh and knee (fascia lata).

Fig. 4.27. Deep fascia of the posterior region of the leg.

CP and sites of pain of retromotion sequence of the lower limb

Fig. 4.28. Distribution of referred pain of retromotion cc(s).

The red stars are situated over the joints. As movement occurs here, then this is where incoordination also manifests. The cc of retro-genu and retro-talus are located halfway on the thigh and lower leg, whereas the cc and the cp of retro-coxa and retro-pes almost overlap.

Mf unit of retro-talus re-ta

Fig. 4.35. Site of pain and its origin.

Site of pain or CP:
Achilles tendinitis, heel pain, plantar fascitis... these are some of the diagnoses typical of disturbances in this mf unit.

Origin of dysfunction or CC:
the Achilles tendon sheath becomes inflamed if it is misaligned and this occurs if the muscle fibres contract asynchronously.

Fig. 4.36. Movement verification.

Ask the patient to walk on tiptoes (specific for tendinitis) or on their heels (more specific for heel spurs or periosteal pain).

Fig. 4.37. Treatment.

Patient prone, therapist manipulates with elbow over myotendinous passage of the triceps surae at the centre of the two gastrocnemii heads, insisting more towards the lateral head.

Mf unit of retro-pes **re-pe**

Fig. 4.38. Site of pain and its origin.

Site of pain or CP:
pain in external border of foot does not allow weight-bearing, patient is forced to walk on their heel. Callus formation on V° toe is common in chronic cases.

Origin of dysfunction or CC:
fibrosis of the lateral compartment of the foot can determine abductor digiti minimi spasms, with deviation of the lateral phalanges.

Fig. 4.39. Movement verification.

The patient's gait is indicative but not selective; ask patient to weightbear, in succession, on the heel, forefoot, internal and external border of the foot to determine the most painful part as this is useful for the post-treatment verification of pain reduction.

Fig. 4.40. Treatment.

Patient side lying, lateral border of foot uppermost; therapist uses knuckle to palpate the base of the fifth metatarsal head for any fascial alteration.

...The authors present a novel model concerning the contribution of fascia to neuromuscular coordination through a specific topography of centers within the fascial network (centers of coordination, centers of perception, and centers of fusion). While this is a completely new model, it is presented in a very convincing manner. The evidence given in this book in support for this intriguing model, covers not only corroborating phylogenetic and neurophysiological details, but includes thousands of hours of anatomical cadaver research, performed by the original founder of this approach, Luigi Stecco, as well as his daughter Carla Stecco MD and son Antonio Stecco MD. Their diligent cadaver studies have resulted in several new anatomical discoveries and descriptions, published in peer-reviewed scientific anatomical journals. Anybody who has followed the emerging new publications on fascia in the scientific literature in the last few years will have noticed these important contributions. This family team has studied fascial morphology and topography in detail, which is not only impressive but also resulted in the novel descriptions and findings that support the new model for neurofascial coordination presented in this book....

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