

**AIFIMM Formation**

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## **Clinical Reasoning**

### **1. Introduction**

In the previous sections, we developed a theoretical model for understanding how the musculoskeletal system functions: from the mechanics of muscle fibres to complex systems, from segmental vector analysis to the physical laws governing muscular shortening.

This section aims to translate that knowledge into tools for everyday clinical reasoning.

The approach that follows does not replace established diagnostic skills. It integrates them through a systemic perspective grounded in physical principles.

Since a symptom may be the expression of local suffering, referred suffering, or systemic disturbance, only observation of the system as a whole, alongside analysis of the individual element, makes it possible to interpret these different possibilities correctly.

### **2. The Four Constants (4K): recurrent observations in the presence of a symptom**

When a symptom caused by mechanical conflict appears, in the absence of congenital or acquired disorders, four recurrent constants can be observed at the level of the musculoskeletal system.

#### **2.1 First Constant (1K): intra-articular mechanical conflict**

The symptom or functional impairment is determined by intra-articular mechanical conflict.

When forces concentrate in restricted areas instead of being distributed uniformly across the articular surfaces, the conditions are created for localized mechanical conflict.

The G and R forces, instead of being distributed across the whole support surface, become concentrated in limited zones and produce localized overload.

#### **2.2 Second Constant (2K): asymmetric vector shortening**

The muscular vectors that should ensure correct articular alignment are asymmetrically shortened along dominant vector lines.

This causes intra-articular misalignment.

Loss of the articular axis is always the consequence of muscular dominance.

There are no joints that “move out of place by themselves.” It is the asymmetry of muscular traction forces that determines alteration of the physiological articular sequence.

### **2.3 Third Constant (3K): systemic misalignment**

In the presence of a symptom, not only does the symptomatic joint fail to respect physiological references, but, to a greater or lesser extent, all the joints of the body are involved in the misalignment. Often, the most misaligned joints are not the symptomatic ones.

The interdependence and interaction of all elements mean that a local perturbation spreads systemically. The symptomatic joint may represent the “breaking point” of a system already compromised as a whole and may not necessarily be the site of the greatest misalignment.

### **2.4 Fourth Constant (4K): systemic distribution of shortening**

Just as asymmetric muscular shortening does not affect only one joint but involves the whole myofascial apparatus, producing diffuse articular misalignment, muscular shortening is also distributed throughout the whole system.

### **2.5 The constants in the absence of symptoms**

In the absence of symptoms, the third and fourth constants are still present.

The mechanisms that sustain the rise in muscle tone and the subsequent shortening of the connective portions are always active in every human being through the psychosomatic, neurophysiological, and biomechanical systems.

The onset of the symptom is linked to the time factor and to the accumulation of shortening. The patient is often “surprised” by the symptom and is unable to connect it to a specific triggering event.

This happens because symptom onset represents the exhaustion of the protective mechanisms of the a priori antalgic reflexes.

## **3. Differential diagnosis: local or referred symptom**

A symptom, expressed as pain, functional impairment, or both, may have a local origin or may be the expression of suffering arising from another body district.

Causal differentiation is a decisive element in correctly guiding therapeutic intervention.

### **3.1 Symptom of local origin**

A symptom expressing local suffering may be sustained by three different conditions.

### **1) Articular mechanical conflict**

As already observed with regard to the first constant, an alteration of the physiological articular sequence can be detected in the affected district, and this alteration is sufficient to explain the symptom.

The imbalance in the distribution of the G and R forces produces concentration of loads in restricted areas and creates the conditions for intra-articular mechanical conflict.

### **2) Alteration of muscular dynamics with substitutive mechanisms**

The joint may present a static arrangement that appears physiologically normal, while dynamically revealing altered motor strategies.

The system uses substitutive movement strategies in which muscles not anatomically assigned to the action are recruited through emergent synergic coordinations.

The joint therefore moves as if it were in mechanical conflict, generating aphysiological motor patterns that produce symptoms even in the absence of obvious static structural alteration.

These altered mechanisms may also manifest through protective limitation of articular excursion, aimed at preventing latent conflicts from becoming manifest, or through co-contraction of muscles that alters movement biomechanics.

### **3) Intrinsic muscular problems**

The symptom may also derive from localized muscular contractures, fascial “knots,” trigger points, or other alterations of the contractile and connective components of the muscle which have not yet produced significant changes in the articular axis.

These problems are generally easier to resolve because they are limited to the muscular component alone, without structured articular involvement.

## **3.2 Referred symptom**

In patterns of referred symptom, no sufficient local alteration is found to justify the symptom.

The symptom may instead be sustained by three main causes.

### **1) Axial alterations in other body districts**

Loss of the physiological articular sequence in one body district may be responsible for symptomatology manifested in distant areas through the functional connections of the musculoskeletal system.

Systemic interdependence means that a perturbation propagates along extended functional chains.

### **2) Peripheral symptoms of vertebral origin**

A vertebral problem may manifest through pain or functional impairment in peripheral sites following the dermatomal projections of the corresponding nerve roots.

### **Clinical example:**

A patient presents with knee pain.

The local objective examination does not reveal articular or ligamentous problems sufficient to justify the symptom.

The dermatomal connection with L3-L4 may help identify this region, which will appear altered, as the cause of the peripheral symptom.

Similarly, elbow pain in the absence of significant local alteration may be the expression of vertebral suffering at the T1-T2 level.

### **3) Secondary muscular shortening**

The symptom may derive from secondary muscular shortening triggered by problems arising from other body systems.

This mechanism will be explored further in the section dedicated to primary and secondary shortening.

## **3.3 Differential diagnostic tools**

To correctly orient the differential diagnosis between local and referred symptom, four main tools are used.

### **1) Static objective examination**

Aimed at revealing the principal articular misalignments and mechanical conflicts.

Observation of bodily asymmetries is interpreted according to the principles of vector dominance.

### **2) Dynamic objective examination**

Aimed at identifying altered muscular activation patterns.

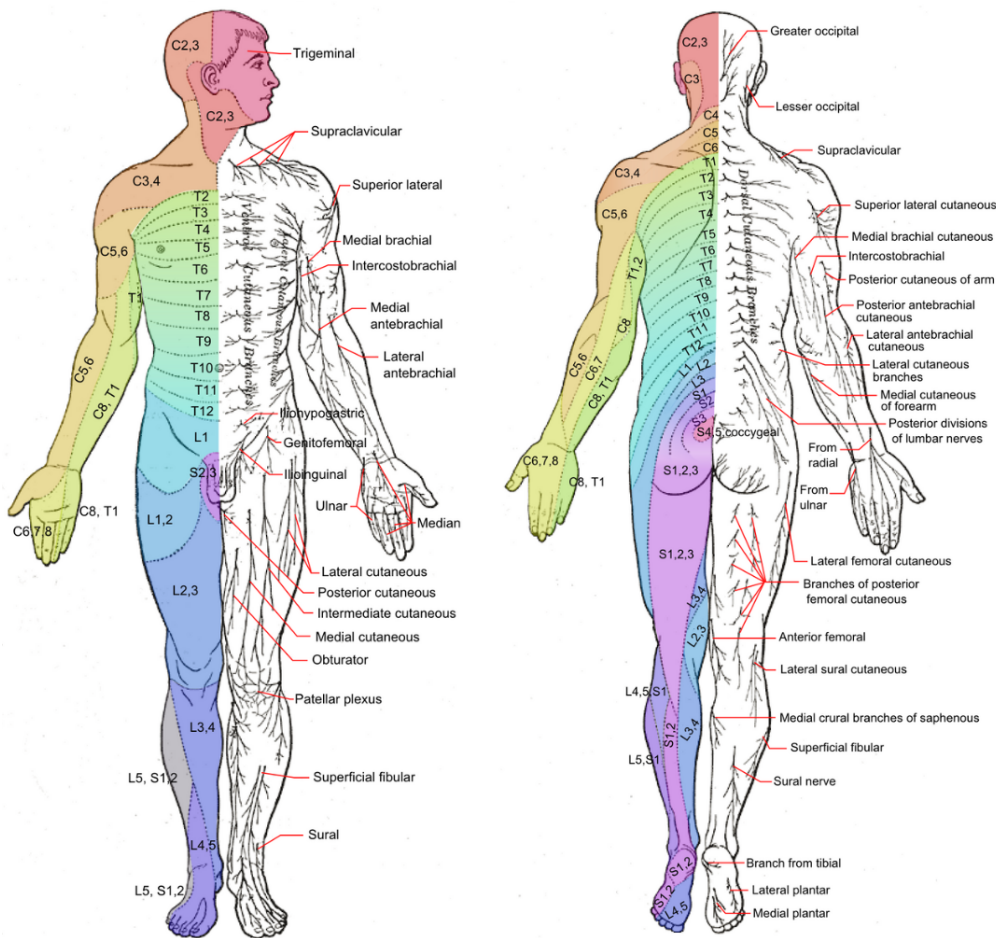
The musculoskeletal system may generate substitutive strategies in which muscles not anatomically assigned to the action are recruited through emergent synergic coordinations.

Dynamic examination may also detect muscularly based limitation of articular excursion, that is, the presence of joints “imprisoned” by muscles behaving almost as if they were skeletally blocked.

Their limited excursion is intended to prevent latent conflicts from emerging.

These protective limitations may not be identified by static assessment but become evident during movement.

### 3) Dermatomal and peripheral innervation charts



The charts of dermatomal territories and peripheral innervation show the distal projections of vertebral suffering.

They therefore make it possible to trace a peripheral symptom back to a possible vertebral cause, identifying which spinal segment may be involved in the genesis of the symptom.

#### 4) Identification of alterations in other systems

Targeted tests aimed at detecting primary alterations originating in other body systems, stomatognathic, visual, visceral, and others, that may produce secondary muscular shortening.

### 4. Somatic symptoms of visceral origin

Visceral pathologies or dysfunctions may also determine somatic symptoms through neurological organ-vertebra connections.

Symptoms may manifest both at the vertebral level and peripherally, following the projections of the corresponding nerve roots.

Viscero-vertebral correlations are an important element of differential diagnosis, because a symptom of visceral origin may manifest with the same characteristics as a primary musculoskeletal symptom.

## Vertebral level — Correlations

- Skull – C2: ENT, TMJ
- C3 – T2/T3: esophagus, diaphragm, heart
- T4 – T5: stomach, lungs
- T6 – T9: duodenum, liver, intestine, pancreas, biliary tract, spleen
- T10 – L2: diaphragm, adrenals, kidneys, ureters
- L3 – coccyx: colon, bladder, genital organs

### 4.1 Clinical example

A patient presents with knee pain.

The local objective examination does not reveal specific articular or ligamentous problems sufficient to justify the symptom.

Observing the corresponding dermatomal vertebral connection, a significantly altered configuration is found at L3-L4, with compression and segmental sinking.

This condition may underlie the referred symptom.

Therapeutic treatment aimed at decompression and rebalancing of the muscles acting on the affected vertebral segment produces only temporary reduction of symptoms, and the instability of the results suggests the possible presence of a visceral disorder. A colon dysfunction, through its neurological connection, may maintain tension at L3-L4 and be the origin of the problem.

In this case, without resolution of the primary visceral disorder, work on the musculoskeletal system cannot remain stable over time.

### 4.2 Differential diagnostic criterion

The distinction between a primarily vertebral problem and one secondary to visceral dysfunction is based on therapeutic response.

If the problem is primarily vertebral, vector rebalancing is decisive and stable.

If it is determined by visceral origin, the improvements are temporary and the symptom tends to recur.

## 5. Primary and secondary muscular shortening

The distinction between primary and secondary muscular shortening also guides therapeutic strategy.

### 5.1 Primary shortening

Primary muscular shortening is determined by the action of the three systems described earlier: the psychosomatic system, the neurophysiological system, and the biomechanical system.

Each of these systems uses muscle as its final effector through an increase in basal tone which, maintained over time, involves the connective component and determines permanent residual shortening.

Clinically, primary shortening represents the largest group of causes underlying musculoskeletal symptoms, and in these cases vector rebalancing may be decisive.

Therapeutic intervention acts both analytically and systemically: analytically, by rebalancing the individual joints through lengthening of the muscles responsible for the specific deformities; systemically, by ensuring that no worsening appears in other districts.

Reduction of Resistant Force in favour of Working Force is obtained through restoration of the physiological length of the contractile and connective components of the muscles identified as dominant in producing the articular misalignments.

## **5.2 Secondary shortening**

Secondary muscular shortening is the adaptive consequence of structural or functional alterations in other systems.

In this case, the muscular system is not the origin of the problem, but the pathway through which a local problem, by determining a district muscular imbalance, can produce systemic articular misalignment.

Symptoms may be expressed locally, but also in distant skeletal regions.

In the section on the temporomandibular joint, it was analyzed how a structural alteration of the stomatognathic apparatus can determine district muscular activation in shortening which then, through hyoid connections, may propagate to the cranio-cervico-scapular system.

A similar principle applies to alterations in other systems.

Another example may be represented by a skeletal alteration involving leg-length discrepancy.

The pelvic imbalance that follows may trigger a chain reaction: the muscles acting on the pelvis reorganize asymmetrically in order to maintain equilibrium.

This reorganization may propagate systemically through the spinal column up to the upper districts, producing, for example, scapulo-humeral conflict.

The symptom may manifest locally, in the zone directly affected by the structural alteration, or at a distance, in districts that have had to compensate for the impairment through adaptive muscular reorganization.

Examples of secondary muscular triggers originating from other systems include:

- stomatognathic system: occlusal alterations which, through swallowing, determine imbalance in the cranio-cervico-scapular system
- skeletal system: dysmetria, congenital or acquired structural alterations requiring permanent muscular compensation

- visceral system: pathologies or dysfunctions which, through organ-vertebra neurological connections, determine muscular tension in corresponding segments
- visual and auditory systems: functional deficits determining compensatory head positioning

If, in order to see or hear better, it is necessary to keep the head rotated or inclined, the cervical vertebrae organize themselves in that position, triggering consequent adaptive muscular reactions.

- neurological system: central lesions determining hypertonus, peripheral lesions determining deficit in muscular activation

Any system, beyond those mentioned, may be the origin of secondary muscular shortening. In these cases, a multidisciplinary approach is necessary.

### **5.3 Identification of secondary shortening**

The presence of secondary muscular shortening may be detected through different diagnostic tools.

Specific tests for the different systems make it possible to identify primary alterations.

In the case of the stomatognathic apparatus, for example, the bite test reveals the interference of occlusion on the muscular system.

For the visceral system, the organ-vertebra correlations analysed in the previous section guide the diagnostic investigation.

Instrumental examinations, such as radiographs, MRI, or laboratory tests, may reveal structural alterations affecting various systems.

The most relevant clinical signal, however, remains the response to treatment.

In secondary shortening, vector rebalancing produces temporary improvements: the articular corrections obtained are lost and the symptoms tend to recur.

This instability of the results indicates the presence of a primary cause that is still active and continues to require muscular adaptation.

## **6. The multidisciplinary approach**

In these cases, intervention by the appropriate specialist is necessary in order to resolve the primary cause.

Resolution of the disorder of the involved system may be sufficient for remission of the symptom.

In other cases, even after the primary cause has been removed, chronic muscular shortening may persist.

At that point, vector rebalancing, no longer hindered by the primary perturbation, may produce stable results over time.

Both in the presence of primary and of secondary shortening, alteration of the physiological articular sequence occurs, both analytically and systemically.

In primary shortening, restoration of muscular vector equilibrium may be decisive.

In secondary shortening, resolution of the specific disorder by specialists is necessary, eventually followed by restoration of muscular vector equilibrium.

## 7. The two equations

In the previous sections, we analysed the mechanics of muscle fibres, vector analysis of dominant forces, the characteristics of complex systems, and the mechanisms that generate muscular shortening.

We saw how each articular district presents specific configurations determined by precise vector dominances.

In conclusion, the multiplicity of clinical manifestations can be traced back to two processes.

### 7.1 First equation: primary shortening

Absence of alterations in other systems → Primary muscular shortening → Alteration of the articular sequence → Mechanical conflict = Pathology

In this equation, the muscular system is the origin of the process.

Shortening arises from the action of the three systems already analysed: psychosomatic, neurophysiological, and biomechanical.

Resolution passes through vector rebalancing of the muscular system.

### 7.2 Second equation: secondary shortening

Alteration in other systems → Secondary muscular shortening → Alteration of the articular sequence → Mechanical conflict = Pathology

In this equation, the muscular system manifests a problem that originates elsewhere: visceral, stomatognathic, skeletal, visual, auditory, neurological systems, and so on.

The shortening represents an adaptive attempt in response to a primary structural or functional alteration.

Resolution requires intervention on the primary cause.

### 7.3 Operational synthesis

Behind the different diagnostic labels—epicondylitis, carpal tunnel syndrome, low back pain, neck pain—there are local manifestations of one of these two processes.

The distinction between them is not only theoretical, but concretely determines therapeutic approach and prognosis.

Understanding which of the two equations is active in a given patient makes it possible to orient intervention correctly, avoiding prolonged treatment of secondary shortening that cannot stabilize without resolution of the primary cause, or, conversely, searching for non-existent causes when the problem lies in the muscular system itself.

## 8. Conclusions

The approach developed in this text represents the natural evolution from the empirical intuitions of Françoise Mézières toward a scientific understanding of the musculoskeletal system.

This does not mean devaluing the work of predecessors, but building on solid foundations so that those who come after may progress further.

The four observable constants, the tools of integrated assessment, the viscerosomatic correlations, and the two fundamental equations provide the clinician with a system for transforming observation into biomechanical diagnosis.

Understanding the underlying physical principles makes it possible to interpret the observed phenomena, predict their evolution, and guide therapeutic interventions capable of remaining stable over time.

## 9. Section summary

### **The Four Constants (4K) of musculoskeletal symptoms**

1K: intra-articular mechanical conflict causes the symptom.

2K: asymmetric shortening of the dominant vectors determines misalignment.

3K: the misalignment is systemic, not only local, and the symptomatic joint may not be the most compromised.

4K: the distribution of muscular shortening is also systemic.

### **Third and fourth constants are always present**

Even in the absence of symptoms, misalignments and shortening are systemically distributed. The symptom emerges because of the time factor and the accumulation of shortening, when the protective mechanisms of the a priori antalgic reflexes are exhausted.

### **Local symptom: three possible causes**

1. Articular mechanical conflict with alteration of the articular sequence.
2. Alteration of muscular dynamics with substitutive mechanisms and aphysiological motor patterns.
3. Primary muscular problems, contractures and trigger points, without structured articular involvement.

### **Referred symptom: three principal origins**

1. Axial alterations in other districts that propagate along functional chains.
2. Peripheral symptoms of vertebral origin, dermatomal projections.

3. Secondary muscular shortening due to disorders in other systems.

### **Viscero-somatic correlations**

Visceral pathologies or dysfunctions may determine somatic symptoms through organ-vertebra neurological connections. The symptom may appear at the vertebral level or in the periphery, following neural projections.

### **Tools of differential diagnosis**

Static objective examination, misalignments and mechanical conflicts.

Dynamic objective examination, altered patterns and protective limitations.

Dermatomal and peripheral innervation charts.

Tests for alterations in other systems.

### **Distinction between primary and secondary shortening for defining therapeutic strategy**

Primary: determined by the psychosomatic, neurophysiological, and biomechanical systems.

Solution: analytical and systemic vector rebalancing.

Secondary: adaptive consequence of alterations in other systems.

Solution: intervention on the primary cause in order to obtain stable results.

### **Clinical signal of secondary shortening**

Therapeutic instability: the articular corrections are lost and the symptoms recur. This indicates that the primary cause is still active and that a multidisciplinary approach is necessary.

### **The two fundamental equations**

First: absence of alterations in other systems → primary shortening → alteration of the articular sequence → conflict → pathology.

Second: alteration in other systems → secondary shortening → alteration of the articular sequence → conflict → pathology.

### **Operational synthesis**

Behind different diagnostic labels, epicondylitis, carpal tunnel, low back pain, neck pain, lie local manifestations of one of the two fundamental processes. Understanding which equation is active guides both therapy and prognosis.

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