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Research Article

Importance of Angles for Load Lines and Segmental Arrangement of the Spine in Biomechanics for Lumbar Health

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Abstract

This article aims to emphasize the structural composition of the spine, its components, arrangement of segments, geometric characteristics, possible responses its related components and action of forces according to physical laws in the static and dynamics of the musculoskeletal system. All of the above based on the importance of back pain and especially the lumbar spine with ahigh incidence and prevalence. The scientific world through various publications reports the existence of vertebral pain in 3 out of 4 subjects of different origins with a huge economic cost for industrialized countries ranging from 1.7% to 2.4% of the gross domestic product (GDP) of each country.

Preventive and therapeutic actions require an exhaustive assessment of all the tissues that make up and intervene in the static and dynamics of the musculoskeletal system and in particular the spine. Their static and dynamic interactions depend on the angles of the segments depending on their geometries. This study will fulfill its objective if it manages to arouse the interest of the scientific world towards all the sections that have been the subject of a review of studies cited in this article for future implementation without waiting for early degenerative processes.

Keywords: Load Lines; Segmental; Spine; Biomechanics; Lumbar; Health

Introduction

The various scientific works and publication of statistics indicate the socio-economic-labor repercussions of back pain. [1] in the United States low back pain constitutes 25% of the disability is work is and causes a loss of 1400 days a year per 1000 workers. The repercussions of back pain in its various aspects are also addressed by a multitude of authors in their publications [2-4].

Bibliographic reviews in any area of scientific knowledge and analysis of results and even in the reports of official bodies of the world indicate a worrying incremental incidence and prevalence in relation to the socio-economic-labor aspects of the general population. Lumbalgia is one of the most frequent pathologies and with enormous prevalence of between 60% and 80% of the population throughout life [4], the prevalence of 80%. [5,6] points to the prevalence of 80% and indicates low back pain as the main cause of osteoarticular problems; and according to the estimate of the National Health System of the Ministry of Health and social services is the first chronic health problem and the cause of 12.5% of all sick leave, which represents a loss of 16. 000 million euros/year, equivalent to 1.7% of the country's GDP.

[7] The highest incidence of chronic low back pain is in the population between 35 and 55 years, this period being the time of greatest productivity of the subjects [8].

Problems of the spine of degenerative origin are associated with some activities with great physical effort, certain lifestyles, working conditions, which can end in surgery [9].

In health and its undeniable socio-economic results, researchers and health professionals seek studies focused on recommendations and actions through ergonomic-therapeutic measures to improve the life of the population in view of the adverse statistical results of the existing multidisciplinary informs.

Moving forward with guarantees for the control of the multiple adverse repercussions of back pain requires objectivity, impartiality, multidisciplinary and exhaustive knowledge of the structures, architecture, biomechanics and physical laws that provide the functionality of the segments appropriately or inappropriately.

Reviewing the structures, their individual and global architectures and geometries, the physics and function of the segments at the service of the whole of the body machinery can prevent, alleviate the ailments with a broad therapeutic-preventive vision.

Objective

Open a new scenario to prevent, alleviate ailments and a new therapeutic vision. Knowledge and usefulness of the tools in relation to the application of the different angular inter-segmental degrees of the musculoskeletal system and especially the lumbosacral region is vital. This requires a multidisciplinary vision between different structures, their individual and global architectures and geometries, without losing sight of the influence of physical laws and the function of the segments at the service of the whole. Perhaps this can slow down the degenerative process with recommendations on appropriate actions.

Study design

This is a comprehensive bibliographic review study, based on the descriptive-observational approach that contrasts what has been published focused on structural composition, architectural arrangements of the segments with their articular degrees, incidence of the forces on the resistance offered by these structures, interaction of the different structures, both statically and dynamically. in relation to the lumbosacral region.

Material and Method

The approach of this descriptive study with the following means

- Scientific material describing the structures, their capabilities and qualities.
- Scientific material describing the methods of measuring angles and load lines.
- Scientific articles describing the ailments in relation to these angles.
- Scientific articles that establish the interaction of the s segments according to the angles between them.

Structures of the spine, their characteristics and interactions.

It is important to reflect on the structural composition of the spine, its components, arrangement of the s segments, the geometric characteristics and biochemical responses of the related components and the action of forces according to physical laws.

Intervertebral disc and what happens to it throughout its functional life

[10] transfer of water contained in the gelatinous substance of the nucleus through the holes of the articular cheeks to the center of the vertebra by the pressure of the body weight in an erect position. The pressure at the end of the day decreases the hydration of the nucleus, influencing the thickness of the disc and consequent total loss of the height of the spine of about 2 cm. In addition, it establishes the inverse relationship during the night in the absence of the axial pressure of the force of gravity based on the hydrophilic concept of the nuclei.

[11] Consider a that between 20% to 30% of the height of the healthy spine is due to the separador function of the discs for the adjacent vertebrae.

[10] It states: “As the state of precompression is more accentuated in the morning than at night, spinal flexibility is greater at the beginning of the day.”

[10] Emphasis and highlights the considerable pressure of imbibition of the nuclei that reaches 250mmHg according to CHARNLEY, and adds that with age this pressure decreases and hydrophilia decreases the state of precompression; hence the decrease in height and flexibility in the elderly.

[12] They refer to Kapandji´s 1974, who in [13] turn pointed out or who showed that by applying a constant load on an intervertebral disc the decrease in disc thickness was not linear but exponential, a sign of a dehydration proportional to the volume of the nucleus. Removing the load removes the initial thickness of the disk recovers exponentially, but this recovery takes time. Repeated uploads and downloads to the disk in a prolonged and repetitive manner do not give the disk time to recover; and the phenomenon of aging is observed.

[10] It indicates that the compressive force of the load is greater as it progresses caudally. He adds, if we consider the weight of the trunk of a person of 80 Kg is 30 Kg and the lumbar segment L5/S1 supports 2/3 of this weight, being 10 Kg, and to this we add the 3 Kg of weight of the head, 14 Kg of weight of the upper limbs, we are facing a weight of 37 Kg on the lower segment of the lumbar spine. To this should be added the paravertebral musculature, absolutely necessary to maintain the static and the upright position of the trunk. If to all the above is added the action of loading and intervention of a sudden overload, we can supposer the forces that the lower discs must support, and that can exceed their limits of resistances, especially in the elderly.

[11] describes the viscoelastic composition disc with buffering and recovery capacity against coherent deformities. It reports that the decrease in height in standing appears at 4 hours of standing (Contrasted with the absence of the force of gravity by astronauts).

[10] It establishes differences between healthy and injured disc in terms of the decrease in disc height. A healthy disc in front of 100 Kg of load is crushed 1.4 mm widening, while an injured disc in front of the same load is crushed 2mm and its recovery of post-load [14] thickness is incomplete. This loss of thickness affects the interapophyseal joints and in the long run is a factor of osteoarthritis. The height of the lumbar disc is 9 mm, dorsal 5 mm and cervical 3mm. Leonardi, locates the center of the nuclear equidistant from the anterior and posterior edge of the vertebral body and yellow ligament, being the point of balance.

The World Health Organization (WHO), in 1999 incorporated the measure of BMI body mass index ≥ 30 kg/m2 or a ratio between waist circumference (CP) and hip circumference (PCd) ≥ 0.90 in males and ≥ 0.85 in women as an evaluation criterion [14] and [15].

[15] Our body is made up of multiple substances (water, fat, bone, muscle, etc.) with water being the majority component, representing between 50-65% of the body's weight.

Bone structure, behavior and strength

[16] and [17] indicate response of bone structures in 2 phases to be subjected to the application of force

- Elastic stage very dependent on the degree of rigidity with a temporary deformation while the application of force lasts and after that its primary condition is recovered.
- Plastic stage in terms of the increase in strength, in this case the bone partially recovers its condition, but some deformity remains. When the force applied is greaterthan the strength of the bone structure, fracture occurs.

In all the above, the magnitude of the force has a fundamental role with respect to the angle of action and typology of the force (Torsion, Tension and Compression), bone density, bone composition and bone architecture according to the type of bone.

Cartilaginous structure, condition and strength

[18] They consider the pondral overload as one of the risk factors for cartilaginous tissue. They indicate the intermittent load and movement of the joint as necessary elements for the physiology of the articular cartilage, being an avascular, a neural, alinafáticos tissue with a need for nourishments that come from the circulating synovial fluid through the extracellular matrix.

The rupture of the collagen network facilitates the retention of water by the proteoglycans, sand generates edema of the cartilage and initiates the arthritic process.

Ligamentous structure, condition and resistance

[19] Ligaments are short bands of strong fibers that connect to the tissues that attach to the bones in the joints. Its mechanical function is to guide normal movement," adding: "The freedom of mobility is achieved by the lubrication action of the cartilage that covers the surfaces of the knee bones. Ligaments and tendons are soft collagen tissues. Tendons connect muscle to bone and ligaments interconnect bone to bone and have a very significant role in the musculoskeletal structure."

[20] in relation to the Flavum ligament it is located between the various vertebral portions that close the vertebral spaces and among others has the purpose of maintaining or recovering the erect position.

The flavum ligament is a dense and elastic connective tissue, when stretched to almost 150% of its original length they reach their breaking point; it is able to support a weight of 15 N during the different movements, with a percentage of sustainability to flexion of 16%, to lateral inclination and axial rotation of 3%.

Tendon structure and its function

Structural nexus medium composed of fibroblasts or tenocytes, collagen, connective tissue and extracellular matrix or fundamental substance with bundles of type I collagen and elastin, are poor in vascularization, but with abundant sensory innervation. It is a regulator of muscle contraction that improves with mechanical responses. [21] and [22].

[23] They are attributed a maximum deformation of 8-10% of the resting length.

[24] According to the Young Module, the tendon reaches a stiffness of 1-2 GPa when the stress force is exceeded by 30 MPa. On the other hand, values between 1,000 J/Kg to 4 are reported. 500 J/kg until structural failure. The resistance to tension is estimated in a range between 5% to 25%, with concentration of values around 10%.

Muscle, its composition, its behavior. Neuro-muscular system and its joint influence.

Muscle tissue is a specialist in transforming chemical energy into mechanical energy through muscle contraction, with muscle being an organ made up of a myofascial system with 2 types of tissues, muscular and connective, whose independence depends on its effective functioning in contractile, elastic and hardening capacity [25].

The contractile tissue acts as a shock absorber of viscoel material, at the maximum contractile capacity in 4 ms after the tensile of action and is maintained about 30 Ms. As an example, in the race the twins and the anterior tibial contract between 120 to 180ms before touching the ground, to take advantage of the elastic energy after contact [60] and [26].

[26] muscles are involved in maintaining joint homeostasis during body movements. highlight the importance of the neuromuscular system for the management and control of intermuscular action, interaction and coordination through the nervous system and neuromuscular response under the perfect functioning of muscle physiology. [11] states that, with movements, and especially with exercise, the nutrition of the discs is favored.

Geometry and structural positioning in the angular approach of the segments for mobility and distribution of the load force based on adequate angles and physical laws.

Once addressed the structure osea, disc, ligamentous, tendinous, cartilaginous, etc. is of great interest and diagnostic, preventive and therapeutic utility, the geometry of the vertebral components of the spine.

[27] in his thesis he highlights "Lumbar curvature has the advantage of having greater resistance to compressive forces. In a straight spine the axial compressive forces would be transmitted through the vertebral bodies and discs, and the only protective mechanism would be the absorption capacity of the intervertebral discs. In a curved lumbar spine axial forces are transmitted through the backs of the disc, while the anterior part tends to separate. In this way compressive forces tend to accentuate lumbar lordosis. This tendency strains the anterior ligaments, which resist such accentuation. Therefore, some of the energy is dissipated in the tension of the anterior ligaments and part is transmitted directly to the next vertebral level."

[28] and [29] estimate the posterior height of the lumbar discs between 6 to 7 mm lower than the anterior height. Hence, the surface of the lower plate of L5 is not parallel to the sacrum and the angle formed varies from 6º to 29º with an average value of 16º.

On the other hand, the posterior wedging of the vertebral body of L5 makes the posterior height 3mm lower than the anterior A Delorme in [30].

[30] According to [28] the vertebral inclinations in the lumbar spine by lordosis, they provide that the vertebra bodies slide forward and down, this slippage is prevented by the posterior arch of L5/S1 by means of joint processes.

[27] in his thesis he concludes that the results studied from L1 to L5 make it clear that the anterior and average height of the vertebral bodies increases progressively and decreases significantly in the L5. According to the publication the [31] load of the spine from the cervical to lumbar region is increased dependent on the resistance of the spongy bone.

From the above, it can be summarized that the posterior height of the vertebral body remained constant in the first three lumbares vertebrae (L1-L3) and decreased significantly in the last (L4/L5).

In other words, the dimensions of the posterior height of the vertebral bodies at the levels is L4, L5 were similar to the anterior height of L1, L2, so the shape of the vertebral body at L1, L2 gives us an inverted mirror image of the bodies of L4, L5, while that of L3 remained constant.

Disk behavior with mobility

[10] highlights the state of pretension of the annulus fibers that varies according to the action to which the disc is subjected

- Axial traction increases the height of the disc, increasing the tension of its central fibers.
- Axial compression force to crush the disc, widens the disc and increases its internal pressure. The core is flattened, and the axial pressure is transformed into the lateral pressure of the disc.
- Inside compressions, the pressures are directed to the opposite side of the pressure, increasing the tension on these fibers of the disc, while the torsions tighten the oblique fibers and cause the obliquity of the linear fibers of the disc.

Usefulness of angles in biomechanics and loading

It is transcendental the knowledge of angles between different segments of the locomotor system after the approach of the structures and their characteristics of interest for this article. It is obvious that these biological structures of geometric designs require an architectural positioning and angulation that facilitates the mechanics of movement without risk of injury. The variation of these positions conditions the segmental angles and influences the load lines supported and the biomechanics of the locomotor system.

Variations can positively or negatively affect the segments involved in the musculoskeletal system according to physical laws.

The angles of the region are collected in the work [32] to study each case and analyze what will happen with the variation of them locally and/or at a distance as a basis for prevention and treatment in each case.

It is advisable to consider the Sacro horizontal angles, lumbosacral angle, angle of inclination of the pelvis, lumbar or total segmental angle, Peterson's lumbosacral, angle diedro lumbosacro, angle lumbosacro, ángulo de deslizamiento Muñoz, eje longitudinal del s acro in relation to the lumbosacral angle, variability of angle measurement method Polly., *et al*. Index discal lumbosacro e Index De Sèze para la lordosis.

Results

The results that we can abstract from the material and method section, indicate the great complexity of the locomotor system, the importance of each structure especially in the lumbar segment due to its high level of affection throughout life, its great static and dynamic interaction thanks to the angular factors and the resistance of the structures. All at the service of an appropriate weight distribution, good architectural stability and wide mobility.

Discussion

[33] in relation to posture cites to [34] define posture as a total result the positions of all joints of the body; From the mechanical point of view, posture is defined as multi-segment structural positioning. The correct posture is defined as one that does not overload the spine or any other element of the musculoskeletal system [35,36].

[33] in relation to loads and load lines, it points out that 60% of the body mass is located in the L3/L4 segment, but this load in the sedation or standing with 20º flexion increases by 200% in this segment, and if the subject loads in his hands 20 kg the load in the

L3/L4 segment reaches 300%. Not only the load is responsible for structural damage but the angle adopted between the segments [37].

[38] shown in live measurements that the pressure on the nucleus pulposus depends on the conditions of the load and the posture being greater the pressure in sedation than in decubitus.

[39] in relation to the intradiscal pressure for the L4/L5 segment indicates 0.08 MPa for the supine position with slight hip-knee flexion, it is increased to 0.1 MPa when extending the knees and hips; in prone with elbow support and extension of the spine reaches 0.25 MPa of pressure, in standing the intradiscal pressure is between 0.48 to 0.50 MPa and with Valsalva maneuver it reaches 0.92 MPa; in sedation with aligned rachis the pressure is from 0.45 to 0.50 that with a backup is reduced; in flexion of the trunk in sedation without support for the upper limbs an intradiscal pressure is generated between 0.83 to 0.90 MPa in maximum flexion that with the support of the upper limbs the pressure decreases to 0.43 MPa; and finally lifting a weight with aligned rachis and the flexed lower limbs reduce the intradiscal pressure by 25% with respect to the flexion posture of the rachis.

[40] In their is study they report greater average strength on the facets of L4/L5 and discs in lordosis than in lumbar kyphosis, while in the kyphotic posture the forces of shear and ligamentous tension were greater, in addition to the loads on the anterior pillar.

Posture influences intramuscular pressure. For example, a kyphotic posture produces intramuscular pressure of 120-130 mmHg, while in standing these values range between 10-25 mmHg [41].

[42] lordosis in standing is 50% higher than in standing.

[43] report that the development of the sports gesture in relation to the biomechanical development of cade segment in each gesture conditions the sports brand in relation to the time. To avoid this loss the spine acts as a block and prevents loss of Time in the transition of movements of each intervertebral joint, this fact is achieved thanks to the isometric action to d e the paravertebral musculature, which probably generates a concentric internal compression on the intervertebral discs.

[10] it establishes a close relationship between hydration and flexibility as if they were synonymous.

[44] establishes the average of the acetabular anteversion angle of 20º, being higher in women than men with a variability of about 15º. These reported degrees may be of interest when placing the acetabular prosthetic cups avoiding an inappropriate anterior tilt of the pelvis, which could force the lumbo-sacral angles.

[45] reported significant variation in the measurement of Ferguson angle in bipedal position that decubitus with knees in extension. Important finding to consider the iliac blades and the sacrocoxboneas an indivisible unit.

[45] point out that according to Nachemson the pressure load in the L5/S1 disc is four times greater in static standing than in decubitus, these loads with obesity and pregnancy are increased, it also indicates that with abdominal contraction and greater buttocks the pelvic tilt is rectified, with which that it automatically decreases the shear forces of L5/S1, corrects hyper lordosis and decreases the load on the facet joints; the same happens if the subject flexes his coxofemoral joints.

[46] sees the need to implement prevention guidelines in the primary setting, such as secondary schools, as part of the students' curriculum. This form of prevention would help to reduce in part the appearance of this symptomatology and the expenses in treatments and rehabilitation.

It would be of great value to reflect on inactivity, rest, immobilizations, etc. when there is not enough segmental mobility and the intervertebral disc in its Dihedral angle and lumbosacral disc index has closed for too long the posterior wall of the intervertebral disc, it may have contributed to shortening of the annulus fibers. That in a maximum flexion of the lumbar spine cannot exceed the tensile force in separation of the posterior wall of the disc together with the thrust of nucleus purpose in the posterior direction, being one of the causes of possible future injuries.

[26] emphasizes neuromuscular control to achieve in a coordinated and effective rapid regulation of the neuromuscular principles of coactivation of agonists and antagonists and reciprocal activation for greater joint protection ensuring feedback and anticipation mechanisms for optimal neuromuscular control in move-

ments and postures. The sensorimotor system is the fundamental element in maintaining the ideal overall posture and segmentaría. This fact could indicate that the training of this system could influence the adequacy of angular positioning of different segments, including vertebral segments [47].

In therapeutic strategies of the joints [18] points out that the attention of the physiotherapist should not focus only on the affected joint since surely there are deficits in the adjacent joints and overloads in the contralateral extremity.

In relation to structural bone strength [11] based on the studies indexed in his article, he indicates that the corticals of the vertebral bodies resist 10% of the total resistance of the vertebrae. The estimate of the compressive fracture strength of the body's ranges from 600 to 800 Kg and adds that the vertebral body fractures before the disc. It would be of interest to jointly assess the health actions.

[11] points out that, over the years, the resistance of the vertebral bodies decreases in such a way that compared to every 25% decrease in bone mass, the resistance decreases by 50%, due to the loss of transverse junctions between the trabeculae. He gives the medula an interesting hydraulic cushion function in maintenance of tension based on the mechanical closure of the system.

[11] states that disc protrusion in cadavers occurs by bending and tilting the spine with an axial compression of 15 to 60 kg. The disc that is most affected is the L5-S1 segment when there is moderate disc degeneration. The annulus fibrosus tears from a pressure of 250 kg and the disc is completely broken with 320 kg on average; and in addition, on many occasions the pressures that the column supports are when lifting a weight is 700 kg.

Perhapsit [11] indicates that in the face of a compressive force the vertebral body fractures earlier (with an estimated 600 to 800 Kg) than the discor refers to a greater capacity of the disc to withstand the compressive force.

Logically, live tests have muscular action, a fact that does not happen in corpses.

On the other hand, the publication of a document under the title pathology of the vertebral inter disc of the Completeness University of Madrid indicates that the nucleus pulposus when subjected to a hydrostatic pressure greater than 80 Kpa (kilopascal) expels water and loses height, thus increasing the osmotic pressure by stopping the external water. When the hydrostatic pressure falls below 80 KPa the nucleus pulposus expands by water inlet that dilutes the macromolecules, the osmotic pressure falls and the water input ceases. Perhaps the greater height of young subjects in the mornings than at the end of the day is due to this effect [59].

Possible causes of pathologies in load

It is universally accepted that excess lordosis and anteversion of the pelvis are the main causes of pain. [48] A study was carried out on the angle lumbosacral, Cunnighan Index and total lumbar index on 204 patients with functional low back pain selected randomly among 2,909 patients with long history of low back pain. The work concluded the influence of

- The angles of the lumbar and horizontal sacral lordosis.
- Indices dependent on disc morphology that condition the lumbar and lumbosacral angles and vice versa.

Both influences are useful for the diagnosis and evolutionary control of recovery programs in functional low back pain.

[49] places the vertical sagittal axis as a straight line running from C7 to the tip of the upper sacral platform and defines the sagittal balance. This axis could show their close relationships and interactions.

[50] after the simulation carried out on 2,772 configurations based on the measurement of compression force and anterior shear on the levels L4/L5/S1 and performance of the multifid muscles, very long and rectus abdominis. The relationship between induced loads with risks of herniated discs, vertebral fractures, spondylolisthesis and low back pain was observed.

In reference to the possibility of calculating the tensional force at the lumbar level supported by an individual we can refer to a section the book Ergonomics and applied psychosociology Lex Nova, S.A [51].

(http://www.lexnova.es/Pub_ln/Supuestos/supuesto100.htm) in the biomechanical description of the bear ability of the intervertebral disc indicates that the nucleus pulposus located between the plates of the vertebral bodies and the semipermeable membrane of the fibrous annulus, is subjected to hydrostatic pressure by the load that is transmitted through the vertebral bodies. This load varies with the position and with the weights that the person supports. Thus, the function of the disc is to cushion and transmit loads that reach the vertebrae. The nucleus pulposus has a colloid-osmotic pressure that depends on the macromolecules of the matrix that attract water. Turgor pressure is the pressure against resistance of a body that is able to expand by absorbing water. Oncotic pressure is the sum of both (turgor and hydrostatic pressure). The nucleus pulposus moves depending on the movements, in backward flexion and in forward extension. This statement can explain the function of load axes and positioning of the existing segments and angulations inter segmental.

[52] indicates the need to measure the lumbar curve in young people as a method of diagnosis and forecasting of risks of low back pain. When the lumbar angle increases the decline of the plane also increases, causing pain due to distension of ligamentous structures and overload of joint structures. In addition, in a static position, the increase in angle conditions a hyperlordosis that is a cause of pain by several mechanisms: compression of the lumbosacral intervertebral disc in its back, overload in the interapophyseal joints, narrowing of the lumbosacral conjunction foramen and root compression [53]. In addition to the lumbosacral angle there are other lumbar angles that determine the lumbar curvature that should not be downplayed, as is the case of the angle of lumbar lordosis, which is observed in a lateral projection x-ray by the intersection of two lines: one that goes from the top of the first lumbar vertebra and the other from the upper plateau of the sacrum, as you have described [32]. This angle may be influenced by the lumbosacral angle and is of importance when assessing lumbar curvature [54].

[55] lumbar hyperlordosis is the consequence of an adaptation in search of general balance and particularly of the pelvic waist (pelvic joints, knee, foot imbalances or on the contrary kyphosis, cervical lordosis or pelvic waist; or perhaps anteversion or retroversion of the pelvis).

[55] points out important data called dorsal and lumbar flexibility index by Schober's method, which in standing marks the vertebrae D1 and D12 to know the distances between both points that results from 27 cm, which in flexion increases 4 cm in a person with good physical conditions. On the other hand, mark the spinous process of S1 and 10 cm higher, when asking for the maximum flexion would increase 5 cm.

In the scientific literature, muscle potentiation occupies a privileged place in musculoskeletal alterations and occupies the first palliative-therapeutic recommendation. [61] end the description of production muscle strength in two muscles of the same volume, one with fibers of or horizontal orientation another oblique in an example of assumption of 10 N of force per fiber concludes that the oblique muscle multiplies by the cosine of the fiber its strength since the muscle with oblique fibers can contain in the same muscle volume more numbers of fiber than the muscle with longitudinal fibers, therefore, the oblique muscles are designed to produce strength and the longitudinal ones, speed. His example includes Longitudinal muscle strength: F = 9*10N = 90N and oblique muscle strength: F = 14*cos(30º) * 10N = 121.2N. For the above, muscle strength is a part of future attention, but it is not all that can be done, the body not only has a quality of strength.

[10] and [11] attributes to the disc the mission of separating the vertebral bodies, with the ability to increase the size of an adult and the decrease in height at 4 hours of standing, giving an example to astronauts. In this study we consider is for pathologies of disc origin (dehydration) it would be better to perform readaptation exercises in the first 4 hours after rest to take advantage of the partial rehydration obtained by rest-discharge at rest or not.

As reflected in the works presented in the last decade, technology provides the instruments that at the command of artificial intelligence contribute to the mechanisms of programmable action for the maintenance of various body segments under strict control and respect for the physical qualities and angles between the segments [56-58].

Conclusion

- Except for diseases of metabolic, systemic and/or degenerative origin, the ailments of the rachis are due to the deterioration of the structures by improper use of the body, the structural deterioration is also of the segments that continue in the inappropriate interactions.

- Each structure and segment in the body has specific characteristics that we must respect as users and take into account as professionals.
- Any movement or body posture is the sum of movements or positioning of the segmentaries, which in turn depends on the angulations between those segments. In tasks of care of the musculoskeletal system and prevention, all this must be the subject of analysis.
- The first step of action is to alleviate the anomaly since low back pain is the consequence and not the cause.
- The solution to lumbar odor is not only to improve the physical quality of muscle strength, but the body also has more qualities that require the same attention. The appearance of low back pain and its care are due to all these qualities, reasons and structural conditions of the body.
- The angulation between the body segments is one of the most important elements in the care of the spine in general and lumbar in particular because it is the foundation of the rest.
- The recommendation of rest and physical exercise is appropriate, but within the limits of the structural capacities and geometric conditions of the segments.
- Appropriate intersegmental angulation is an essential element of load line bear ability.
- The lumbo-sacral angle L5/S1 or D12/S1 together with the dihedral angle or L5/S1 mark the adequacy of the load lines for the transfer of the load force and segmental biomechanics in the prevention of structural damage in the lumbar region or risks to the whole of the spine.
- The load lines fall on different body segments according to the posture adopted by different joints.
- In some sports activities the sports gesture of each discipline not only conditions the mechanics of the movement but can also increase the segmental demands by enabling or disabling the other segments in their kinetic sequences.
- Hydration is an essential element in achieving greater flexibility.
- There is a direct interaction between lumbosacral angles with coxofemoral angles.
- The dexterity of the neuromuscular system is essential for the synchronized activation of agonists with antagonists.
- Injuries caused by the compressive force the resistance of the intervertebral disc is greater than that of bone tissue.
- In understanding the behavior of load lines and kinetic mechanics of the spine, there are similarities in the behavior of Th1 for C7 and L1 for Th12 and S1 for L5.
- It is accredited that the various conditions of the structures condition other structures in the whole of the musculoskeletal system.

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