

Spinal sensitization syndrome segmental: new criteria proposal diagnostic research

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Summary

Introduction: Segmental spinal sensitization syndrome (SES) is a clinical picture of regional musculoskeletal pain

chronic, frequent in everyday physiological consultation. It was described by Fischer in 1997, based on the concepts of Maigne and Gunn.

The "persistent bombardment" of nociceptive impulses towards the spinal cord and the "neurogenic dysfunction" of the nerve root

according to the Law of the Denervation of Cannon and Rosenblueth, they are the probable causes of this syndrome. Its low diffusion is due

that there is no consensus on the criteria to diagnose it. Material and methods: We present a proposal of criteria

for the diagnosis of SES, according to the clinical experience of the authors. Results: The operational definition of the SES

It has been prepared in order to be efficient, with a reduced number of items (only the essential ones). With this we can

obtain homogeneous sets that are comparable. It is not intended to be a clinical picture of this syndrome.

Conclusions:

This set of criteria will provide a standardized frame of reference for research for epidemiological purposes in different

countries This will evaluate, in future work, the interobserver validity and the prevalence, risk factors will be obtained

and the most effective rehabilitation treatments for SES.

Keywords: Segmental sensitization, diagnosis, musculoskeletal pain.

Introduction

Segmental spinal sensitization syndrome (SES)

(spinal segmental sensitization syndrome (SSS), is

a painful regional and chronic musculoskeletal syndrome,

first described by Dr. Andrew A. Fischer in

1997.¹ based on the works of Dr. C. Chan Gunn^{2,3} and Dr.

Robert Maigne⁴. This entity is very frequent in the consultation

Daily physiatry We found that 27% of the

patients who went for chronic pain to a doctor's office

rehabilitation presented the SES.⁵ Patients usually report pain at the level of the spine with irradiation to the corresponding body segment, producing pictures

such as headache of cervical origin (diagnosed as

"Tension headache"), cervicobrachial syndrome (which is confused with a "chronic painful shoulder"), back pain radiated to the chest (giving "non-cardiac anginal pain") or

abdomen (giving rise to nonspecific visceral pictures), and

"sciatic" lumbocytic pain (Figure 1). Sensitization

segmental is a state of fiber hyperexcitability

nerves, which react to weaker stimuli

than the normal threshold, spreading to nerve fibers

adjacent, producing repetitive discharges in form

prolonged from a single stimulus⁶. The diagnosis is

based on the presence of neurological symptoms and signs that

they are manifestations of hypersensitivity (Table 1).

The causes of SES are not yet fully established,

the main theories being: 1) "persistent bombing" of nociceptive impulses of damaged and / or sensitized tissues (such as a muscle tear, osteoarthritis, or a trigger point myofascial), which can induce changes in processes peripheral and central (mainly in the spinal cord) leading to an abnormal sensitization state, which results in spontaneous pain, hyperalgesia and allodynia in the corresponding segment^{7,8}; and 2) "neuropathic / radiculopathic" due to an alteration of the peripheral nerve, on everything at the root level, since it is very vulnerable in its emergency through the conjunction hole⁹. In this area usually be subject to compressions, stretching, angulations and friction, aggravated by the decrease in the diameter of the space by a protrusion of an intervertebral disc or by osteophytes. The involvement of the nerve root would give rise to a hypersensitivity according to the Law of the Denervation of Cannon and Rosenblueth⁹. This physiological law states that when a nerve does not function properly ("neuropathy"), the white structures or organs that are innervated by it they become hypersensitive and behave erratically, giving place to hyperalgesia and allodynia in the dermatome, muscle shortening in the myotoma, nervous system disorders sympathetic at the peripheral level, and alterations of the sclera (tendons, ligaments and joints) corresponding^{2,3,10}.

The main problem for SES compression lies in that this is a functional disorder, that is, no structural damage is found in the musculoskeletal system,

but rather an alteration of the neural function that gives
Origin to chronic pain. When we use the term
"Functional" we mean an alteration of function
physiological, which is very subtle so that it can be
reflected in visible structural defects¹¹ and, therefore,
somatic functional syndromes must be differentiated
of psychiatric, and not assume that all patients
that have unexplained symptoms and that cannot be
corroborated by auxiliary exams (such as
X-rays, ultrasound, tomography, MRI, electromyography or blood tests) have a background
psychological ¹². Irritable bowel syndrome and syndrome
of fibromyalgia are examples of painful clinical conditions
functional not attributable to a mental disorder. Because
that the new nomenclature approved by the International Association for the Study of Pain (IASP)
in English) only accepts the term neuropathic pain to
those caused by a defined lesion or disease of the
nervous system¹³, we had to reformulate the concept
of SES as a regional musculoskeletal disorder of
"neurogenic" origin because it is functional in nature (without
structural injury).

So far, the SES has been diagnosed using
Fischer's diagnostic criteria¹⁴⁻¹⁷. These are the ones
establish a diagnosis of individual patients and are
very complete, with an emphasis on sensitivity (avoiding
false negatives) ¹⁸. However, they have disadvantages for

epidemiological research: they have not been determined in operational form, and this means that the psychiatrist examining make the diagnosis to the patient «according to the criteria established by Fischer », with a particular interpretation thereof. In addition, it is very difficult to evaluate all the characteristics in a daily medical consultation, where Time is a critical factor. These have been the main obstacles to further studies and, therefore, still There is very little dissemination of SES. Our goal is to present a new standardized set of diagnostic criteria, that is complete and at the same time practical, with fixed and clearly defined criteria, with emphasis on specificity (avoiding false positives), trying to be easy to apply in the usual time of a medical consultation, and thus be able to select patients to obtain homogeneous and comparable groups in population studies¹⁹.

Material and methods

We develop the diagnostic criteria for research purposes of the SES, based on our clinical experience of 20 years of treatment of this clinical picture. A first We try to elaborate these criteria in the 2014²⁰. For their preparation, they have been taken as a reference Similar schemes of diagnostic criteria for two disorders painful functional musculoskeletal: the syndrome of complex chronic regional pain type I (SDRC I) ²¹ and fibromyalgia syndrome²². Symptoms and signs were included in the SES chart

which correspond to both the posterior and the anterior branch of the nerve root involved. Nerve fibers coming from the spinal cord have a distribution segmental in the body, resulting from preservation of nervous system levels as a result of the primitive embryological division in metameres. To each metamere corresponds to a core segment, where it comes from the sensitive root from the root filaments that they are born in the posterior horn, and the motor root from the anterior horn, forming the nerve root that comes out of the hole of conjunction. This nerve root is divided, in turn, into a posterior branch that will innervate the related structures with the spine, and on an anterior branch that is going to form the plexuses and peripheral nerves of the rest of the body²³ (Figure 2). Both the back and the previous branch are going to innervate structures of the corresponding dermatome, myotoma and sclerotoma. The nerve root also has autonomic innervation, predominantly of the sympathetic nervous system (the parasympathetic system is only present in roots S2 a S4). Sensitization produces several important autonomic disorders, such as trophoedema (microedema or "neurogenic edema"), peripheral vasoconstriction ("Coldness"), piloerection ("goosebumps"), increased sweating (which results in a decrease in skin electrical impedance) and trophic changes in the skin, described by Gunn², Maigne⁴ and Fischer¹. These signs are very important in the clinical picture of the patient, but not they are determinants, so we have preferred to stop them from

side in our proposal in order to reduce time
of the physical exam

The SES diagnostic criteria set has three parts:

1. Operational definition of the SES.
2. Anamnesis. Directed interrogation that the physiatrist performs to the patient who comes to the clinic for chronic musculoskeletal pain.
3. Physical exam. All signs must correspond to

spinal segment as referred by the patient in
the history. It consists of three items:

- 3.1. Dermatoma Evaluation Hyperalgesia is sought and / or allodynia through the pinching maneuver / rolled and / or friction with the fingers of the skin.

The distribution of dermatomes varies between
authors, but to standardize criteria we use the
Keegan and Garret²⁴ scheme, the same one he used
Fischer for being more related to distribution
Metameric of the body segments.

- 3.2. Myotoma evaluation. Trigger points are sought and tight bands in the muscles through palpation. For this, the clinical examination is used according to Travell and Simons²⁵.

- 3.3. Sclerotoma evaluation. It is examined looking hyperalgesia and / or allodynia on palpation and / or mobilization of ligaments, tendons, joints and / or periosteum according to the distribution of Inman and Saunders²⁶.

The identified segments are called according to the root
corresponding nerve, for example, SES C6, SES T4, SES

L5, etc.

Results

The proposed SES diagnostic criteria are summarized in table 2.

A. Anamnesis

1. Definition of chronic pain. Chronic pain is what persists beyond the time considered normal for the healing of an injured tissue (more than three months) 27. While it is true that some patients may refer acute onset pain (in a few days or weeks), it was established as a diagnostic criterion that the patient refer at least three months of pain to avoid be confused with disorders that can simulate the picture SES clinic. For example, a fall with bruises in the neck, shoulder and arm, can give a picture similar, but the latter is resolved with medication and rest within a few weeks.

2. Definition of regional and segmental pain. The pain It must have a regional character, as it can be confused with localized pain. For example, spondylosis it can give axial pain (in the spine), but without irradiation to the limb; pain due to tendinitis bicipital can give irradiated shoulder pain to the arm, but not to the cervical spine or forearm; the pain by a meniscal tear in the knee does not radiate to the lumbar spine, etc. Regional pain can also differentiate it from diffuse pain, characteristic of

autoimmune and syndrome rheumatic diseases of fibromyalgia. In addition to being regional, the pain that refers the patient must have the characteristic of be segmental, that is, pain irradiation should correspond to the segment that is being innervated by the corresponding nerve root. For example, innervation of cervical nerve roots can cause pain of neck irradiated to the thoracic region and the limb upper, but not at the waist, abdomen or limb lower. Segmental innervation of lumbar roots it can give pain in the hip and lower limb, but not to the thorax or upper limb.

B. Clinical exam

The criterion of requesting at least four of six signs in the physical exam, he assures us that there will be at least one sign of sensitization of the posterior branch or branch anterior, evaluating an entire nerve root (which corresponds to a core segment). This avoids cataloging disorders that only affect the anterior branch (for example, disorders of plexuses or peripheral nerves), or to the posterior branch. With that we avoid getting confused with similar disorders that affect only to the sensitive component (for example, neuralgia postherpetic or meralgia paresthetica).

- Axial exam. The axial signs correspond to the

posterior branch of the nerve root. The search for hyperalgesia and / or allodynia in the dermatome is done through

of the pinching / rolling maneuver and / or the friction of the

skin within 10 cm of the posterior midline of

the back. Trigger points and / or myofascial tense bands in the myotoma are detected by palpating the muscles

paraspinals The pain in the sclerotoma will be found

palpating the supra / interspinous ligament of the segment

correspondent.

- Peripheral exam. The peripheral signs correspond to the anterior branch of the nerve root. The search of hyperalgesia and / or allodynia in the dermatome is done at

through the skin pinching / rolling maneuver by

outside 10 cm of the posterior midline of the back (preferably at the corresponding limb

or on the lateral and / or anterior aspect of the trunk). Points

trigger, tight bands and / or muscle shortening

in the myotoma they will be found on palpation or stretching of non-paraspinal muscles. Pain in

the sclerotoma will be found palpating or mobilizing

tendons, ligaments, joints and / or periosteum of

structures not related to the spine,

always taking into account that they correspond to it

segment.

The diagnosis of SES is established when the patient

presents chronic, regional and segmental pain, with at least

four of the six signs of the clinical examination. It must be included

the compromised medullary segment (s), naming them according to sensitized nerve root, such as

SES C6, SES T4 or SES L5.

An example of the application of diagnostic criteria proposed we can see it in figure 3.

Discussion and Conclusions

This attempt to develop a new set of criteria for the diagnosis of SES for research purposes, has the purpose of being efficient in the daily consultation, since the Most of the medical specialists do not have the sufficient time for a thorough evaluation according to Fischer criteria.

This will provide a standardized frame of reference for the comparison of patient groups in different centers of research for epidemiological purposes, and is not intended to be a clinical picture for the diagnosis of individual patients

(where all available symptoms and signs should be taken, according to the particular judgment of the attending physician). Expected

that are evaluated by doctors interested in the subject and not be considered as a closed and definitive system.

Based on these criteria, the following steps for futures studies will be: the evaluation of inter-evaluative reliability (interrater reliability), where the κ coefficient will be used to know the consistency of the data that will be obtained from the different researchers; and data collection for know the prevalence of this chronic painful syndrome in the centers where it is implemented. With this we can establish comparative groups and conduct multicenter studies

in different countries to determine risk factors associated and the most effective treatments of this syndrome. Thus we can benefit a large number of patients who go to the physical medicine and rehabilitation services for present SES, and they find no relief with treatments usual pharmacological or surgical.

References

1. Fischer AA. New developments in diagnosis of myofascial pain and fibromyalgia. *Phys Med Rehab Clin N Am.* 1997; 8 (1): 1-21.
2. Gunn CC. The Gunn approach to the treatment of chronic pain: intramuscular stimulation for myofascial pain of radiculopathic origin. 2nd ed. New York: Churchill Livingstone; 1996.
3. Gunn CC. Radiculopathic pain: diagnosis and treatment of segmental irritation or sensitization. *Journal of Musculoskeletal Pain.* 1997; 5 (4): 119-134.
4. Maigne R. Método Maigne. *Medicina ortopédica manual: dolor de Origen Vertebral.* Barcelona: Publidisa; 2006.
5. Nakazato T, Camacho G. Simuleurope.org. [Online].; 2017. Available from: [http://simul-europe.com/2017/ISPRM/Files/\(tomnaka@gmail.com\)Prevalence%20SSS%20-%20Poster%20-%20BsAs%202017.pdf](http://simul-europe.com/2017/ISPRM/Files/(tomnaka@gmail.com)Prevalence%20SSS%20-%20Poster%20-%20BsAs%202017.pdf).
6. Suputtitada A. Spinal segmental sensitization and myofascial pain syndrome: evidences and experiences. *Int J Phys Med Rehabil.* 2015; 3 (4):
7. Romero P. Consecuencias clínicas de la estimulación sensorial persistente: la sensibilización espinal segmentaria. *Boletín El Dolor.* 2005;

14: 42-50.

8. Shah JP, Thaker N. Acupuncture and needling techniques for segmental dysfunction in neuromusculoskeletal pain. In: Valera Garrido F, Minaya MF. Advanced techniques in musculoskeletal medicine & physiotherapy. Elsevier Spain; 2016, p.p. 247-254.

9. Cannon WB, Rosenblueth A. The supersensitivity of denervated structures: a law of denervation. New York: MacMillan; 1949.

10. Gunn CC. "Prespondylosis" and some pain syndromes following denervation supersensitivity. Spine. 1980; 5 (2): 185-192.

11. Kirmayer LJ, Robbins JM. Functional somatic syndromes. In: Kirmayer LJ, Robbins JM. Current concepts of somatization. Washington: American Psychiatric Press; 1991, p.p. 79-106.

12. Mayou R, Farmer A. Functional somatic symptoms and syndromes. BMJ. 2002; 325: 265-268.

13. International Association for the Study of Pain (IASP). Classification of chronic pain, Second Edition (Revised). [Online].; 2011 [cited 2016 October] Available from: <http://www.iasp-pain.org/PublicationsNews/Content.aspx?ItemNumber=1673&navItemNumber=677>.

14. Fischer AA, Imamura M, Dubo H, Cassius D. Spinal segmental sensitization. In: O'Young B, Young M, Stiens S. Physical medicine & rehabilitation secrets. 3rd ed. New York: Mosby; 2008, p.p. 610-625.

15. Unverzagt C, Berglund K, Thomas JJ. Dry needling for myofascial trigger point pain: A clinical commentary. Int J Sports Phys Ther. 2015; 10 (3): 402-418.

16. Suputtitada A. Myofascial pain syndrome and sensitization. Physical Medicine and Rehabilitation Research. 2016; 1 (5): 2-4.

17. Shah JP, Thaker N. Myofascial pain syndrome. In: Cheng J, Rosenquist

- R. Fundamentals of pain medicine. Cham: Springer International Publishing AG; 2018, p.p. 177-184.
18. Belmonte-Serrano MA. El mito de la distinción entre criterios de clasificación y criterios diagnósticos (Cartas al Editor). *Reumatol Clin*. 2015; 11 (3): 184-191.
19. Rudwaleit M, Taylor WJ. Classification criteria for psoriatic arthritis and ankylosing spondylitis. *Best Pract Res Clin Rheumatol*. 2010; 24: 589-604.
20. Nakazato T, Camacho G. Spinal segmental sensitization syndrome as a common cause of chronic musculoskeletal pain: a case series study. *American Academy of Physical Medicine and Rehabilitation*. 2014; 6 (8): S143.
21. Harden RN, Bruehl S, Stanton-Hicks M, Wilson PR. Proposed new diagnostic criteria for complex regional pain syndrome. *Pain Med*. 2007; 8 (4): 327-331.
22. Wolfe F, Smythe HA, Yunus MB, Bennet RM, Bombardier C, Goldenberg DL et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. report of the multicenter criteria committee. *Arthritis Rheum*. 1990; 22 (2): 160-172.
23. Gallardo NJ. La inervación sensitiva segmentaria: dermatomas, miotomas y esclerotomas. *Rev Chil Anestesia*. 2008; 37: 26-38.
24. Keegan J, Garrett F. Dermatomes. *Anat Rec*. 1948; 102: 409-437.
25. Simons DG, Travell JG, Simons LS. *Travell & Simons' myofascial pain and dysfunction: the trigger point manual*. 2nd ed. Baltimore: Williams & Wilkins; 1999.
26. Inman VT, Saunders JB. Referred pain from skeletal structures. *The Journal of Nervous and Mental Disease*. 1944; 99 (5): 660-667.
27. Treede RD, Rief W, Barke A, Aziz Q, Bennet MI, Benoliel R et al. A classification of chronic pain for ICD-11. *Pain*. 2015; 156 (6): 1003-1007.

TABLES

Table 1. Segmental sensitization: clinical diagnosis according to Fischer.

Subjective Pain, tingling, vibration, sensation of needles and pins

Target neurological signs

Sensitive Irritation, sensitization

Hyperalgesia

Allodynia-pressure pain and "pinched / rolled"

Hyperesthesia

The distribution is dermatomic

Parapinal area = posterior primary branch

Peripheral dermatome = anterior primary branch

Motor Muscle spasm and hypersensitive points, trigger points in the myotoma

Paraspinal muscles = posterior primary branch

Peripheral myotoma = anterior primary branch

Sympathetic Segmental vasomotor alteration: constriction or dilation

Trophoedema (microedema)

Sclerotoma Neurogenic inflammation and irritation produce bursitis, tendinitis, epicondylitis, pericapsular trigger points

Table 2. Proposal: diagnostic criteria for segmental spinal sensitization syndrome for research.

General definition of SES: it is a state of hyperreactivity of one or more spinal segments (spinal cord),

which gives rise to a picture of sensitization of the territory innervated by the corresponding nerve root (s), both in its previous branch (s) and later (s), with clinical manifestations in dermatome (hyperalgesia / allodynia), myotoma (trigger points / tight bands / muscle shortening), and sclerotoma (periodic / joint / tendon pain /

ligament)

To make the clinical diagnosis, the following criteria must be met

A. Anamnesis (interrogation). Having the following two symptoms

1. Chronic pain: at least three months duration
2. Regional and segmental pain: axial pain (structures related to the spine), and peripheral (related segments)

B. Clinical exam. Have at least four of the following six signs, corresponding to regional pain and segmental history:

- Axial (structures innervated by the posterior branch of the nerve root)

1. Dermatoma: pain when clamping / rolling and / or friction with the finger at the axial level (the skin and subcutaneous cellular tissue within 10 cm of the midline of the back)
2. Myotoma: pain on palpation of trigger points and / or myofascial tense bands of paraspinal muscles
3. Sclerotoma: pain on palpation of the supra and / or interspinous ligament

- Peripheral (structures innervated by the anterior branch of the nerve root)

1. Dermatoma: pain when clamping, rolling and / or friction at the peripheral level: outside the 10 cm of the midline

of the back (at the level of the trunk and / or extremities)

2. Myotoma: pain on palpation of trigger points and / or myofascial tense bands, and / or stretching of non-paraspinal muscles
3. Sclerotoma: pain on palpation and / or mobilization of ligaments, tendons, joints, periosteum, not related to the spine

FIGURES

Figure 1. Common clinical pictures of segmental spinal sensitization syndrome in physiological consultation
Everyday

Figure 2. Core Segment and Roots corresponding nerves.

Figure 3. Diagnostic example of a right C6 segmental spinal sensitization syndrome (lower cervical segment).