**Spinal sensitization syndrome segmental: new criteria proposal diagnostic research**

Dr. Tomas Nakazato Nakamine, \* Dr. Pedro Romero Ventosilla \*\*  
Address for correspondence:  
Dr. Tomas Nakazato Nakamine  
Manuel Del Pino N ° 110 - Lima 01 - Peru.  
E-mail: [tomasnakazato@yahoo.com](mailto:tomasnakazato@yahoo.com)

Rev Mex Med Fis Rehab 2019;31(1-2):6-12  
<https://www.medigraphic.com/pdfs/fisica/mf-2019/mf191_2b.pdf>  
<https://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=90467>

**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 Gunn2,3 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 SES5. 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" lumbociotic 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 segment7.8; 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) corresponding2,3,10.

The main problem for SES compression lies in

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 physiatrist 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

metamera 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 Yok: 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.

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, Taylr 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 chronico 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).