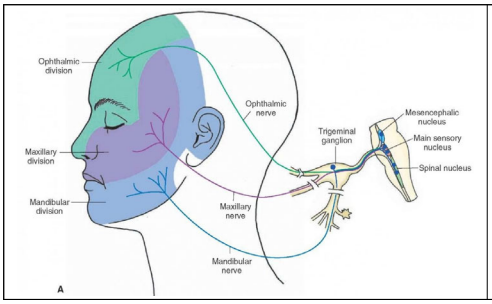


- Trigeminal neuralgia is a chronic pain condition that affects the trigeminal nerve, which carries sensation from your face to your brain.
- If you have trigeminal neuralgia, even mild stimulation of your face — such as from brushing your teeth or putting on makeup — may trigger a jolt of excruciating pain.

A 53-year-old female presents to the pain clinic with trigeminal neuralgia. Which medication is considered a first line treatment for management of this condition?

A. Pregabalin (Lyrica®)
B. Topiramate (Topamax®)
C. Diazepam (Valium®)
D. Carbamazepine (Tegretol®)

- The anticonvulsant class of drugs has been found to be effective in managing this neuropathic pain state, and the gold standard first-line agent is **carbamazepine**.
- **Oxcarbazepine** (Trileptal®, a structural analog of carbapazepine) is thought to have a more favorable side effect/adverse reaction profile as compared to carbamazepine, and has been shown to effectively treat trigeminal neuralgia in cohort studies.
- **Diazepam** is a benzodiazepine commonly used for muscle spasticity.

What is the best medication class for treatment of trigeminal neuralgia in multiple sclerosis?

A. Opiates
B. Anticonvulsants
C. Nonsteroidal anti-inflammatories
D. Tricyclic antidepressants

- Anticonvulsants, particularly **carbamazepine (Tegretol®)** and **oxcarbazepine (Trileptal®)**, are the best studied medication class for neuropathic pain and have demonstrated effectiveness in the treatment of trigeminal neuralgia associated with multiple sclerosis. They are considered the gold standard treatment for trigeminal neuralgia.
- **Tricyclic antidepressants** are also useful but have side effects that may be problematic in patients with multiple sclerosis. **Opiates** are controversial in treatment of neuropathic pain. **Nonsteroidal anti-inflammatory drugs** are used in acute pain to address inflammation; their role in management of neuropathic pain is uncertain.

A 64-year-old female presents to the clinic complaining of pain when she applies makeup. She describes the pain as burning and stabbing and rated 10/10 in severity when pressure is placed on the face. The pain is otherwise between 0 and 1. What is the most likely diagnosis?

A. Trigeminal Neuralgia
B. Herpes zoster
C. Temporal arteries
D. Multiple sclerosis

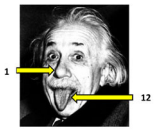
- Pain due to _____ is often described as shock-like, lightning-like, burning or stabbing. It is most common in women and those over 50.
- As the name implies, it is neuropathy of the trigeminal nerve therefore pain is felt in the CN V distribution (V1, V2 and V3) and most excruciating when the area is touched even with the softest pressure. The case will most likely state the pain occurs while the patient brushes their teeth, applies makeup, or shaves.
- While this is a clinical diagnosis, an MRI should be performed to rule out multiple sclerosis and tumors.
- Treatment of choice for trigeminal neuralgia is with anticonvulsants.

CN5 (Trigeminal neuralgia)	CN7 (Facial nerve)
3 branches	5 branches

On	Olfactory (CN*I)	Sensory	Some
Occasion	Optic (CN II)	Sensory	Say
Our	Oculomotor (CN III)	Motor	Marry
Trusty	Trochlear (CN IV)	Motor	Money
Truck	Trigeminal (CN V)	Both**	But
Acts	Abducens (CN VI)	Motor	My
Funny	Facial (CN VII)	Both	Brother
Very	Vestibulocochlear (CN VIII)	Sensory	Says
Good	Glossopharyngeal (CN IX)	Both	Big
Vehicle	Vagus (CN X)	Both	Brains
Any	Accessory (CN XI)	Motor	Matter
How	Hypoglossal (CN XII)	Motor	More

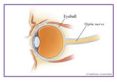
CN 1. Olfactory

S



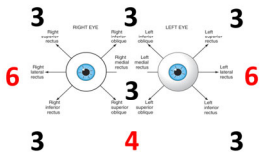
CN 2. Optic

S



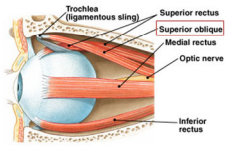
CN 3. Oculomotor

LR_6 = Lateral Rectus / SO_4 = Superior Oblique



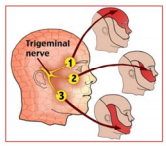
M

CN 4. Trochlear



M

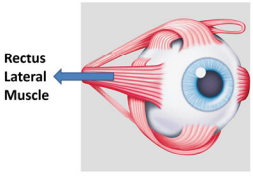
CN 5. Trigeminal



SM

- CN5 = 3 branches
- CN7 = 5 branches

CN 6. Abducent



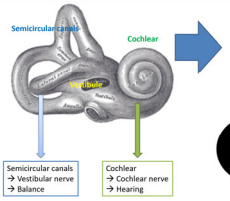
M

CN 7. Facial

Lucky Face

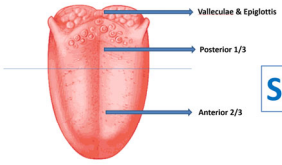
SM

CN 8. Vestibulocochlear



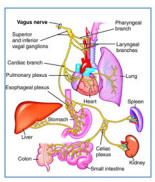
S

CN 9. Glossopharyngeal



SM

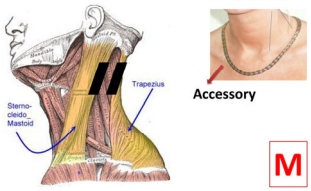
CN 10. Vagus



- Mixed M + S
- Parasympathetic
- Taste Fibers

SM

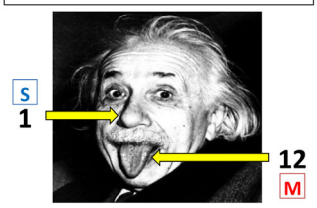
CN 11. Accessory



M

CN 12. Hypoglossal

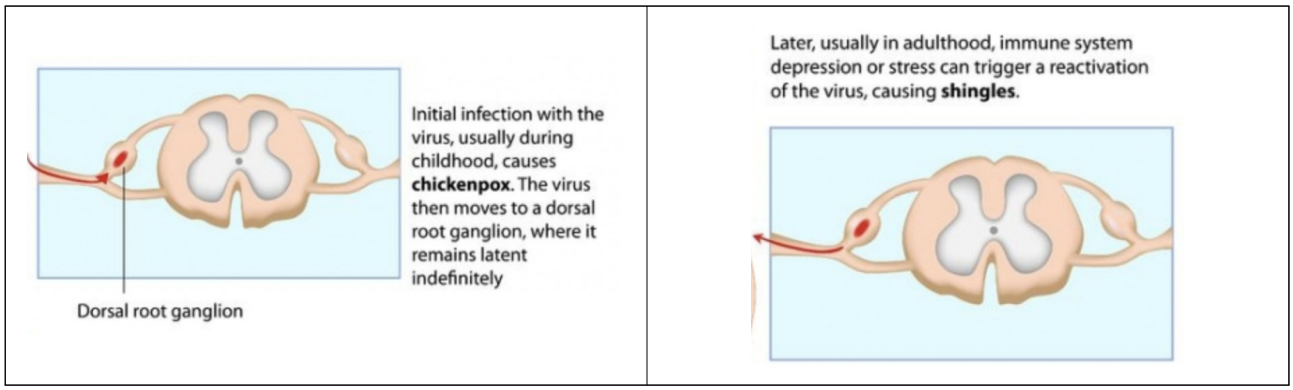
M



Light reflex	
CN2	CN3
afferent (sensory)	efferent (motor)

Corneal reflex	
CN5 (V1)	CN7
afferent (sensory)	efferent (motor)

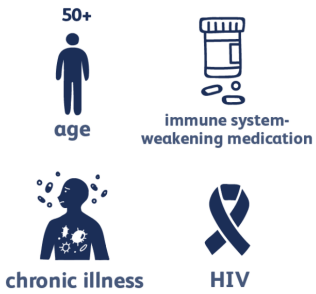
Chickenpox → **Herpes Zoster (Shingles)** → **Post-herpetic neuralgia**



A patient with breast cancer receiving chemotherapy develops a herpetic rash in a dermatomal distribution over her right thoracic wall. What is the most appropriate initial treatment option?

A. Corticosteroids
B. Epidural steroid injections
C. Antivirals
D. High potency capsaicin patch

- In patients older than 50 years, treatment is ideally started within 72 hours of onset of rash. In patients with ophthalmic zoster, neurologic complications, disseminated zoster, or neurologic or immunocompromised patients, antivirals are started irrespective of time. Antivirals used include acyclovir, famciclovir, and valacyclovir for 7 to 10 days.
- In **immunocompromised patients**, intravenous antivirals are initiated followed by oral antivirals.
- Corticosteroid use is controversial, and it must be emphasized that it should not be used alone in herpes zoster, but always in combination with an antiviral agent. Epidural steroids can be used as a subsequent treatment, but duration of benefit is frequently limited, and steroids should not be used without antivirals in immunocompromised patients. The 8% capsaicin patch is an appropriate pain treatment for post herpetic neuralgia, but it is not the initial treatment and it should always be applied after pretreatment with a topical local anesthetic.



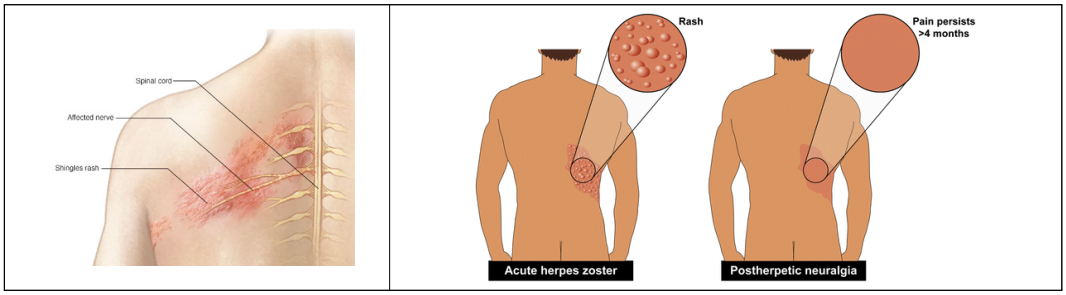
- Cancer (particularly leukemia and lymphoma)
- Caucasian ethnicity
- Chemotherapy
- Diabetes
- Female gender
- Genetic predisposition
- HIV infection
- Immunosuppressive agents and steroids
- Intrauterine exposure to VZV
- Previous VZV infection (chickenpox)
- Psychological stress within previous 6 months
- Recent physical trauma
- Transplant and transplant-related medications
- VZV infection before the age of 18 months

HIV, human immunodeficiency virus; VZV, varicella-zoster virus

The incidence of post-herpetic neuralgia (PHN) increases with:

A. Older age
B. Male gender
C. African American ethnicity
D. Lack of psychosocial stress

- The incidence of developing **Post-herpetic neuralgia (PHN)** is 10-25%, which increases with age, severity of the rash and acute pain, and presence of prodromal pain.
- PHN risk factors include immunosuppression, stress, female gender, and Caucasian ethnicity. The age at the time of childhood infection is not a risk factor for developing PHN.



A healthy 68-year-old female patient comes to your office with a three-day history of burning, lancinating pain along her left low back, and left lateral thigh and calf. Changing position does not affect the intensity or distribution of the pain. Physical examination reveals allodynia and hyperalgesia in the same dermatomal distribution and a negative straight leg raise test. A lumbar MRI scan reveals diffuse spondylosis and mild foraminal stenosis at multiple levels. What is the most likely diagnosis?

A. Neurogenic claudication
B. Early onset Lyme disease
C. Facet arthropathy
D. Post-herpetic neuralgia

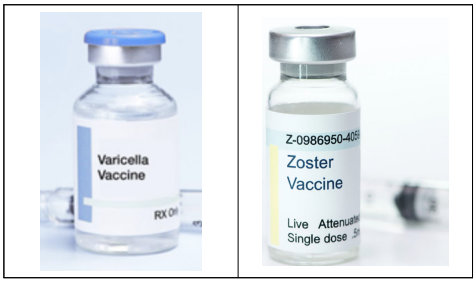
- **Post-herpetic neuralgia** is characterized by radicular pain, allodynea, hyperalgesia, and an erythematous vesicular rash in the same dermatomal distribution as the pain. Pain may predate the rash.
- **Neurogenic claudication** is accompanied by reports of numbness, tingling, pain, and weakness in lower extremities during upright posture, as well as compression of the neural elements within the spinal canal on imaging studies. The onset of **Lyme disease** is not associated with pain. **Lumbar facet arthropathy** is generally associated with achy, shooting, or throbbing pain extending from the low back down the buttocks and posterior thigh but not below the knee. It may be relieved or exacerbated by lumbar movements.

Which of the following vaccinations prevent varicella zoster viral infection from occurring in the first place?

A. Varicella vaccine
B. Zoster vaccine (Shingrix®, Zostavax®)

Which of the following vaccinations is used In the case of an individual who was previously infected with varicella zoster virus?

A. Varicella vaccine
B. Zoster vaccine (Shingrix®, Zostavax®)



Which of the following medications is used for postherpetic neuralgia?

A. Gabapentin (Neurontin®)
B. Pregabalin (Lyrica®)
C. Amitriptyline (Elavil®)
D. All of the above

Which of the following medications have labeled indications for treatment of post-herpetic neuralgia pain?

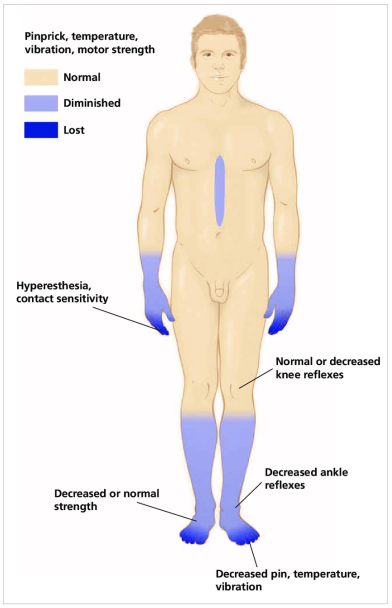
A. Tapentadol (Nucynta®)
B. Gabapentin (Neurontin®)
C. Carbamazepine (Tegretol®)
D. Amitriptyline (Elavil®)

- **Postherpetic neuralgia** is the most common complication of shingles. The condition affects nerve fibers and skin, causing burning pain that lasts long after the rash and blisters of shingles disappear. The chickenpox (herpes zoster) virus causes shingles.
- Medications with labeled indications for treatment of post-herpetic neuralgia pain are **gabapentin (Neurontin)**, **pregabalin (Lyrica)**, **lidocaine 5% patch (Lidoderm)**, and **capsaicin 8% patch (Zostrix)**.
- Tapentadol and amitriptyline have not been specifically approved for post-herpetic neuropathic pain, although Tapentadol has been approved for diabetic neuropathic pain and carbamazepine has been approved for trigeminal neuralgia.

Anti-convulsants (Anti-seizures, Anti-epileptics) → **Nerve-calming qualities**

A 61-year-old male with multiple myeloma has completed induction chemotherapy in preparation for stem cell transplant. He presents in outpatient clinic with pain in his bilateral distal upper and lower extremities in a stocking-glove distribution that started during chemotherapy. Which medication would be most appropriate for this type of pain?

A. Gabapentin (Neurontin®)
B. Acetaminophen (Tylenol®)
C. Carisoprodol (Soma®)
D. Hydromorphone (Exalgo®)

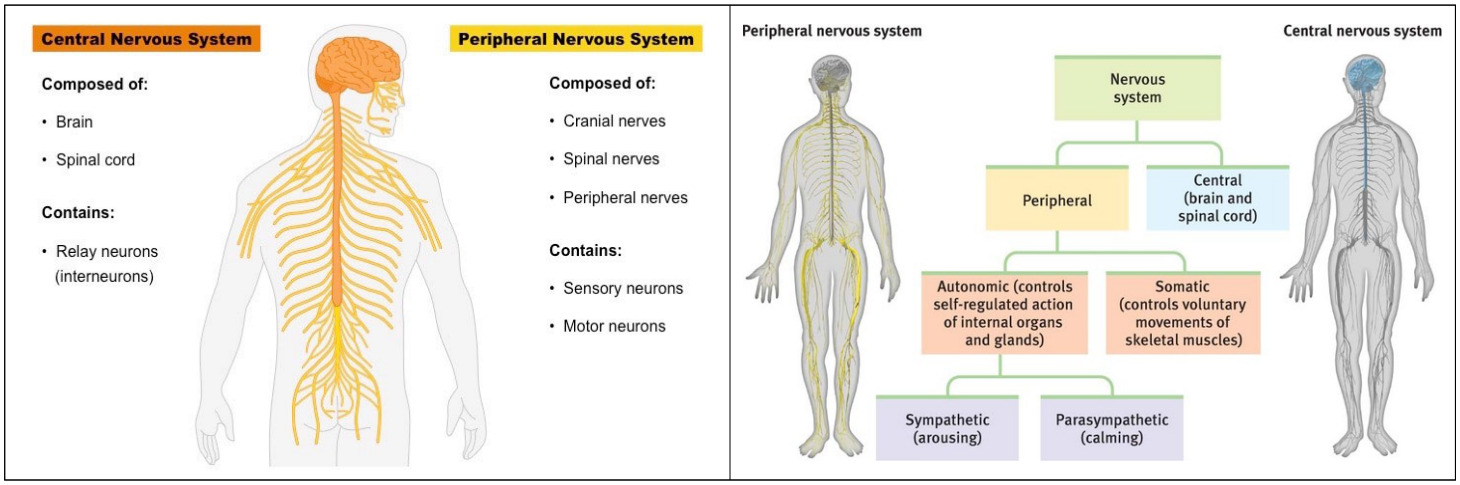


- **Chemotherapy-induced peripheral neuropathy (CIPN)** is one of the most frequent side effects caused by antineoplastic agents, with a prevalence from 19% to over 85%. Clinically, CIPN is a mostly sensory neuropathy that may be accompanied by motor and autonomic changes of varying intensity and duration. CIPN may occur particularly with chemotherapeutics such as the taxanes, vinca alkaloids, and platinum-based agents, among others.
- Anti-depressant medications and anticonvulsants are among the first-line medications prescribed for CIPN. Among the answer choices above, gabapentin is the best choice since it is an anticonvulsant. Although opioids could be helpful, many neuropathic pain states, including CIPN, are often considered to be opioid-resistant.

You are seeing a patient in clinic with painful diabetic peripheral neuropathy. Past medical history is significant for hepatitis C, implanted cardiac defibrillator, chronic renal insufficiency, and depression. You initiate treatment with gabapentin and caution the patient not to take more than 300 mg per day because of his:

A. Hepatic impairment
B. Renal impairment
C. Cardiac arrhythmia
D. Antidepressant use

- It is recommended that the total daily dose of gabapentin be decreased in patients with renal dysfunction due to reduced renal excretion.
- Gabapentin does not affect antidepressant dosing and noted to have few drug interactions. It is not associated with cardiac arrhythmias.



Which of the following nerves belong to the Central Nervous System?

A. Cranial nerves
B. Autonomic nerves (Sympathetic and Parasympathetic nerves)
C. Spinal cord
D. Somatic nerves (Motor and Sensory nerves)

Which of the following nerves belong to the Peripheral Nervous System?

A. Brain
B. Brainstem
C. Spinal cord
D. Somatic nerves

NERVE SYSTEM

CNS (central nerve system)		**PNS** (peripheral nerve system)			
		Autonomic nerves (communicates with internal organs and glands)		**Somatic nerves** (communicates with sense organs and voluntary muscles)	
Brain	**Spinal cord**	**Sympathetic** (arousing)	**Parasympathetic** (calming)	**Sensory** (Afferent)	**Motor** (Efferent)

- **Peripheral neuropathy**, a result of damage to the nerves outside of the brain and spinal cord (peripheral nerves), often causes weakness, numbness and pain, usually in your hands and feet. It can also affect other areas of your body.
- Your peripheral nervous system sends information from your brain and spinal cord (central nervous system) to the rest of your body. The peripheral nerves also send sensory information to the central nervous system.
- Peripheral neuropathy can result from traumatic injuries, infections, metabolic problems, inherited causes and exposure to toxins. One of the most common causes is diabetes.
- People with peripheral neuropathy generally describe the pain as stabbing, burning or tingling. In many cases, symptoms improve, especially if caused by a treatable condition. Medications can reduce the pain of peripheral neuropathy.

A patient with a known history of chronic lymphocytic anemia and liver cirrhosis secondary to alcohol abuse presents with painful peripheral neuropathy. Which of the following antiepileptic medications is least likely to cause adverse effects in this patient?

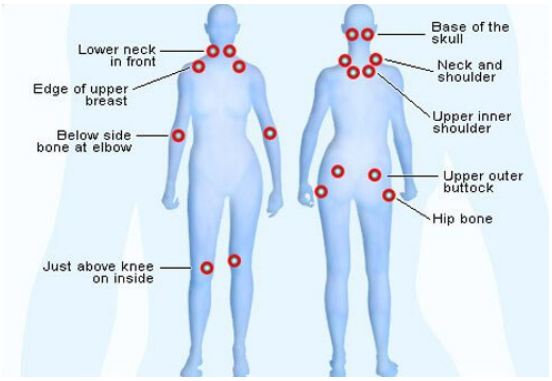
A. Carbamazepine (Tegretol®)
B. Phenytoin (Dilantin®)
C. Valproate (Depakine®)
D. Pregabalin (Lyrica®)

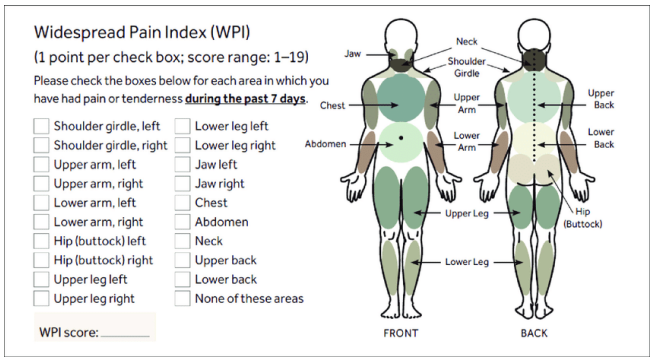
- **Pregabalin** is supported by level A evidence for managing painful peripheral neuropathy.
- **Pregabalin** has no organ toxicities and is generally well tolerated, while **carbamazepine** is associated with aplastic anemia and hepatic toxicity, **valproate** is associated with hepatic and hematologic toxicities, and **phenytoin** is associated with neurotoxicity.

A 50-year-old woman with a history of poorly controlled Diabetes Mellitus (DM) presents with a 4-week history of hip weakness and severe burning pain and paresthesias along the left lateral thigh and calf. An EMG performed today reveals diffuse fibrillation potentials and positive sharp waves with reduced interference pattern in the left gluteal muscles, gastro-soleus, and tibialis anterior with normal paraspinal muscles. A recently obtained MRI scan of the lumbosacral spine and left lumbosacral plexus is unrevealing. The most reasonable course of treatment is:

A. An NSAID and consulting an oncologist to rule out malignancy
B. Intravenous immunoglobulin transfusion
C. Pregabalin and consultation for adaptive equipment
D. An opioid and obtaining a rheumatology consultation

- The acute onset of proximal leg weakness and burning pain in a diabetic with abnormal EMG findings and normal imaging and laboratory findings is consistent with **diabetic neuropathy**.
- A first line treatment for diabetic pain is pregabalin (Lyrica®) and these patients often require supportive conservative management, which may include assistive devices, such as rolling walkers, elevated commode seats, and shower benches. They generally have a good outcome with significant recovery over approximately two years.
- There is no evidence to support an oncology or rheumatology consultation, and NSAIDs are not effective for neuropathic pain. Opioids may be considered if other medication trials fail to provide adequate relief and opioid risk factors have been assessed, but opioids are usually not the first line treatment for neuropathic pain. An intravenous immunoglobulin transfusion is reserved for acute (Guillain Barre) and chronic inflammatory demyelinating myelopathies, but it is not effective for diabetic lumbosacral radiculoplexus neuropathy.





Which of the following is not true regarding fibromyalgia?

- **A. The peak prevalence is age 55 to 64**
- **B. Tenderness to finger pressure must be present in at least 5 of 10 tender point sites**
- **C. No specific etiology has been identified**
- **D. Fibromyalgia is more common among women than men**

Fibromyalgia

- No specific etiology has been identified. More common among women than men.
- The average age of onset of fibromyalgia is between 30 and 50, with peak prevalence among women age 55 to 64.
- Tender points (tenderness to approximately 4 kg/square inch which is about the pressure required to blanch the examiner's nail bed) must be present in at least 11 of 18 specific sites. Widespread musculoskeletal pain must be present over a period of at least 3 months.

Fibromyalgia is characterized by:

- **A. Chronic widespread pain and tenderness**
- **B. An elevated sedimentation rate**
- **C. A rapid resolution with antibiotics**
- **D. Bilateral median neuropathies at the wrist (CTS)**

- **Fibromyalgia:** Chronic widespread pain and tenderness.
- The specific diagnostic criterion is the presence in 11 or more of 18 characteristic tender points.

What is the most helpful treatment option for people with fibromyalgia?

- **A. Corticosteroid joint injection**
- **B. Muscle relaxers**
- **C. Aerobic exercise**
- **D. Opioids**

- Aerobic exercise and addressing sleep pattern are the most helpful treatments. Moderate intensity aerobic training and strength training for 12 weeks may improve overall well-being and physical function.
- Aerobic exercise is essential. A Cochrane review of 34 studies in FM indicate that moderate intensity aerobic training for 12 weeks may improve global well-being and physical function. They also found that strength training for 12 weeks may result in large reductions in pain, tender points and depression, as well as improved global well-being.
- There is no evidence to suggest acute joint pathology and steroids have a role in Fibromyalgia (FM). Although muscle relaxers may have some role in acute muscle pathology, there are no history or exam findings to suggest such a cause. No evidence supports the use of opioids in FM.

Which of the following medications are used as FDA-approved drugs for treating fibromyalgia?

- **A. Carbamazepine (Tegretol®), Phenytoin (Dilantin®)**
- **B. Valproate (Depakine®), Gabapentin (Neurontin®)**
- **C. Carisoprodol (Soma®), Hydromorphone (Exalgo®)**
- **D. Duloxetine (Cymbalta®), Pregabalin (Lyrica®)**

- Duloxetine (Cymbalta), milnacipran (Savella) and pregabalin (Lyrica) are FDA-approved to specifically treat fibromyalgia.