

**VIBRATION DISEASE: DEFINITION, CLASSIFICATION, ETIOLOGY,  
POSITIVE DIAGNOSIS,  
CONTEMPORARY TREATMENT AND PROPHYLAXIS.**

Author: Nicolae Bodrug, Ph.D. șt. med., prof. univ.

**Definition of vibration:**

Vibration is the oscillating movement of a solid body, performed around an equilibrium position, with different frequencies.

**Physical characteristics of vibration:**

- **Frequency** - the number of oscillations of a solid body in a time unit, expressed in Hz. 1Hz corresponds to one oscillation per second;
- **Amplitude** - the maximum distance from the equilibrium position, which is measured in length units (m, dm, cm, mm);
- **Speed** - the product between amplitude and time, which is measured in - m / s;
- **Acceleration** - the product between amplitude and time squared, which is measured in - m / s<sup>2</sup>.

**Classification of vibration:**

**Depending on the frequency, Aristotel Cocârlă in 2009, distinguishes the following groups:**

- Very low frequency vibration - below 2 Hz;
- Low frequency vibration - between 2 and 20 Hz;
- Medium frequency vibration - between 20 and 300 Hz;
- High frequency vibration - between 300 and 1000 Hz, sometimes even up to 5000 Hz and Shaking.

**Definition of vibration disease:**

Vibration disease is an occupational disease caused by prolonged exposure (minimum 3 years) to vibrations present in the workplace. Discovering the vibrations in the professional route is the central element to confirm the vibration disease.

**Definition of professional route:**

The professional route is an overview, a chronological presentation of all the professional activities performed, the duration of those that involved significant exposures and references on working conditions. This data is mandatory to confirm or deny an occupational disease.

**Etiology of vibration disease:**

Vibration disease is characterized by a clinical polymorphism with original evolution.

The main etiological factor is represented by the vibrations of different frequencies, which are clarified by the professional route.

Factors that can install vibration disease earlier are:

- adaptation-compensation capacity (which is the totality of the body's possibilities to correlate its morphological and physiological structures, in order to adjust its functionality, in correlated with changes in living conditions);
- certain cardiovascular diseases;
- diabetes mellitus;
- smoking;
- peripheral vascularization insufficiency;
- Age.

Harmful factors present in the work environment:

- unfavorable microclimate (humidity, temperature and caloric radiation);
- constant presence of noise;

- cooling and the presence of cold air currents;
- static-dynamic tasks, forced working position.

### **Pathogenesis:**

Specific manifestations of vibration disease are:

- affectation of the locomotor and cardiovascular system;
- with the reflective disorders of the internal organs.

The trigger have complicated mechanisms: neurohormonal and reflectors.

Long-term action of vibration on peripheral vibration sensitivity receptors creates conditions for increasing the excitability of the corresponding centers.

Under the action of reflective impulses in spinal neurons, sympathetic ganglia, in other vegetative formations, reticular formation of the brainstem and cortical regions, response reactions develop.

As a result of the disturbances of the CNS regulatory actions on the vascular tone and, in particular, on the state of the regional circuit, intense manifestations of angiospasm appear.

Thus, the deeper the disorders of trepidation sensitivity, the more the vascular spasm is pronounced.

Direct mechanical irritation and contributing damage to the vascular intima cannot be excluded since they can lead to spasm worsening or atony.

Subsequently, the dystrophy develops and the pathological process becomes angiotrophoneurosis, which in the advanced stages tends to generalize.

Trophic disorders occur primarily in the neuromuscular and locomotor system, especially in the muscles, bones and joints of the scapular girdle.

Besides the progressive decrease in receptivity, vibration disease may present:

- algesic, tactile and thermal sensitivity, therefore the excitation of the vibrating centers radiates in the neighboring regions, first of all in the vaso-motor centers;
- Conditioning the changes in functional state of peripheral vessels;

- After the onset of the disease, the excitation is transmitted to the centers of pain and thermal sensitivity.

There are changes in the systems reactivity, responsible for regulating vascular tone.

An essential role in the pathogenesis of vibration disease belongs to both the specific reactions of the body and those that mirror the processes of adaptation - compensation.

As a result of the decrease in adaptation possibilities of the organism and the deterioration of the peripheral and central vegetative formations, advanced stages of the disease develop the hypothalamic syndrome.

### **Vibration disease classification:**

**Depending on the expression degree of the pathological process (Z. E. Droghicina and N. B. Metlina, 1959):**

- Initial form;
- Medium form;
- Aggravated form

**Depending on the anatomical impact region (E. Andreeva-Galanina and V.G. Artamova, 1963):**

1. Vibration disease caused by local vibrations;
2. Vibration disease caused by general vibrations;
3. Vibration disease caused by the action of general vibration and shaking.

**Depending on the expansion degree of the disease caused by local vibration (M. Rijikova, V. Artamova, L. Milkov, L. Metlina, 1981):**

- I. Initial manifestations, compensated form;

**II.** Moderate manifestations, subcompensated form;

**III.** Pronounced manifestations, decompensated form.

**Clinical syndromes:**

In 1967, the classification perfected by Z. E. Droghicina and N. B. Metlina was proposed, which highlighted the seven most common syndromes in the clinical vibration disease:

1. Angiospastic;

2. Angiodystonic;

3. Vegetative polyneuritis;

4. Neuritic;

5. Vegeto-myofascial;

6. Diencephalic;

7. Vestibular.

**1. Vibration disease caused by local vibration:**

This form of vibration is found in those who use mechanized tools in the work process and has the following clinical features:

- The disease develops gradually;
- The main place in the clinic belongs to the peripheral vascular syndrome with pronounced angiospasm;
- Often the disease proceeds latently over a period of time;
- The latent period can vary from a few months to several years;
- Duration depends on the functional state of the body, the state of the compensatory-adaptive mechanisms, the physical characteristics of the vibration and its combination with other harmful factors.

## **I. The compensated form**

Peripheral syndromes:

- Angiospastic with rare angiospasm;
- Angidystonic;
- Sensory (vegetative-sensory);
- Polyneuropathy of the hands.

Suffers from:

- Spontaneous whitening of the fingers attacks, rare, which become noticeable when washing with cold water and total overcooling;
- Cold sensations and delayed restoration of the skin temperature of the fingers after exposure to cold;
- Nocturnal or resting hand pain. After 10-15 minutes from the work begins, the pain usually disappears;
- Slight terminal phalanges sensitivity disorder, paresthesias, a mild decrease of the vibration sensitivity and the capillary tone change;
- Sometimes mild functional CNS disorders can occur.

## **II. Subcompensated form**

Peripheral syndromes:

Peripheral angiospastic:

- With frequent angiospasm
- With vegetative trophic disorders

Sensory (vegetative-sensory); polyneuropathy associated with:

- Dystrophic disorders of the hands and scapular girdle's locomotor system (vegetomyofasciitis, periarthrosis);

- Functional disorders of the nervous system (neuroasthenic and cerebral angiodystonic syndrome);
- Poliradicular changes (cervical polyradiculopathy).

Symptoms:

- Indisposition, asthenia;
- Vegetative dystonia with generalized headache, mild dizziness;
- Sleep disorder and increased irritability;
- Some patients experience precordial pain, palpitations, sweating;
- Painful phenomena and stable paresthesias;
- Changing the capillaries and large vessels tone.

When applying curative-prophylactic measures, the pathological process can be reversible. Otherwise, the process progresses continuously.

### **III. Decompensated form**

Peripheral syndromes:

- It occurs as a sensory-motor polyneuropathy;
- Advanced stages of the disease may include generalized vegetative-vascular disorders;
- Intense vasomotor and trophic disorders.

Symptoms:

- Peripheral angiospasm become more frequent, the intensity of paresthesias and pain sensations increase, sensitivity disorders worsen, vibration sensitivity is suddenly abolished;
- Most patients have asthenia and vegetative-vascular dystonia;
- Hypertension, myocardial dystrophy, degenerative-dystrophic scapular girdle changes, rarely of the spine;

- This phase is distinguished by a torpid evolution, incomplete recovery, even in case of interrupting the contact with the vibration and treatment use.

## **2. Vibration disease caused by general vibration:**

Changes that happen in the human body because of the action of general vibration can be grouped into:

- mechanical
- physiological
- psychological

The pathophysiological mechanisms are not fully discovered yet. Changes in blood flow, on the action of general vibration, on visual and vestibular system are suspicious. There is evidence of increased neuro-humoral factors involved in vibratory stress release.

In order to establish links between the health status of the worker and the occupational risk factors to which he has been exposed, it is absolutely necessary to document the occupational route.

### **I. The compensated form:**

Syndromes:

- Angiodystonic syndrome (cerebral or peripheral).
- Vegetative-vestibular syndrome.
- Sensory syndrome.

Clinical aspects of the general vibration disease- compensated form:

- Peripheral angiodystonic syndrome is characterized by paresthesias and mild leg pain associated with muscle cramps. There can also be acrocyanosis, hyperhidrosis, hypothermia in the legs and hands, a spastic-atonal nail bed capillaries state. Cerebral angiodystonic syndrome manifests with diffuse headaches.

- The vegetative-vestibular syndrome is in the form of dynamic ataxia, the movement precision in these patients is gradually lost.
- Sensory syndrome is expressed by pain in the lower extremities, numbness, sometimes burning sensation in the legs.

## **II. Subcompensated form:**

Syndromes:

- Angiodystonic syndrome.
- Sensory syndrome, polyneuropathy of the lower extremities in combination with:
  - a) polyradicular disorders;
  - b) secondary lumbosacral radiculopathy  
(on the background of lumbar osteochondrosis);
  - c) functional disorders of the nervous system.

Clinical aspects of General Vibration Disease - Subcompensated Form:

- Sensory syndrome (polyneuropathy of the lower extremities) in the lower and upper extremities has sensory and vegetative-trophic disorders. The general vibration leads to direct microtraumatic effects on the spine, the degeneration of the intervertebral disc developing vertebrogenic neurological syndrome, which primarily occurs in the lumbosacral level. Root changes continue with developing chronic lumbosacral radiculopathy with severe pain syndrome and postural myotonia. L4 and L5 roots are most often affected. Motion disorders develop, even leading to paresis, more often in the tibial nerve innervation area. Radiculopolyuropathy begins on the background of osteochondrosic degenerative-dystrophic changes in the spine, deforming cervical spondylosis and lumbar osteoporosis.
- Angiodystonic syndrome in the subcompensated form of vibration disease, the general form occurs with paresthesias and severe leg pain associated with muscle cramps. Marked acrocyanosis, hyperhidrosis, hypothermia in the feet and hands are some of the symptoms. Cerebral angiodystonic syndrome is manifested with diffuse persistent headache.

### **III. Decompensated form**

Syndromes:

- Sensor-motor polyneuropathy syndrome.
- Discirculatory encephalopathy syndrome with peripheral polyneuropathy (encephalopolyneuropathy syndrome).

Clinical aspects of general vibration disease - decompensated form:

- Sensorimotor polyneuropathy syndrome appears with paresis and paresthesias in the lower limbs, associated with persistent edema in the lower limbs. Leg pain sensation becomes persistent and there is local sensitivity accentuated weakness feeling increased from the beginning. This makes it really difficult for patients, later it becomes lower, and can lead to local trauma.
- Discirculatory encephalopathy syndrome clinically presents the following symptoms:
  - a) memory problems, even multiple sclerosis;
  - b) nausea and vomiting;
  - c) dizziness;
  - d) loss of consciousness;
  - e) loss of movement coordination;
  - f) decreased concentration, thinking problems;
  - g) accentuated nervousness.
- Peripheral polyneuropathy, in the vibration disease caused by general vibration, the decompensated form usually manifests bilaterally, symptoms include numbness, paresthesia, burning sensation, vibration in the legs, tingling sensation, severe hyperesthesia and pain. The pain can be deep, it often intensifies at night.

### **3. Vibration disease caused by the combined action of vibration and shaking**

In case of vibration and shaking we can define:

- One of the main syndromes of this pathology is the vegetative-vestibular syndrome, which manifests with dizziness, headache, nausea, nausea.
- Most patients have a decreased vestibular irritability.
- This type of vibration disease is often associated with cerebral angiodystonia.
- Digestive glands dysfunction and gastric secretion disturbance can be caused by regulatory defects, by ptosis of the abdominal organs with subsequent irritation of the solar plexus, developing under the uninterrupted action of shaking.
- Patients who seek medical attention with the aforementioned symptoms must be checked for exposure to general vibration and shaking at work.

#### **Positive diagnosis:**

In order to establish the clinical diagnosis, it is mandatory to establish the **PROFESSIONAL ROUTE** including the professional risk factors evaluated for each job where the suspect has worked and a series of paraclinical examinations:

- Fist clenching force evaluation with the dynamometer;
- Esthesiometry for detecting any neurosensory disorders;
- Local contact thermometry;
- Capillaroscopy of the nail fold;
- Blood tests;
- Comparative hand radiography;
- Spine radiography;
- Blood pressure measurement using photoplethysmography;
- The cold water immersion test;
- Cold challenge test;
- Infrared thermography;

- Electromyography.

### **Differential diagnosis:**

It is mandatory to exclude vasospastic manifestations of other etiologies:

- Primary Raynaud's syndrome (Raynaud's disease);
- Secondary Raynaud's syndrome;
- Raynaud phenomenon;
- Syringomyelia;
- Polyuropathies;
- Periarthritis.

### **Prognosis:**

The prognosis is generally good, even in the absence of sustained treatment. The prognosis is worse for younger patients, smokers, diabetes patients, coexistence of other vascular diseases and prolonged exposure to high frequency vibrations.

### **Treatment:**

Treatment in vibration disease aims to reducing clinical manifestations, reducing pain intensity, improve nerve activity and reduce vasospasm.

#### **Peripheral vasodilators**

- **Pentoxifylline** I.V. of 2% - 5 ml, administrated as an intravenous infusion in 150.0 ml of 0.9% sodium chloride solution, for 10 days.
- **Vincamine** I.V. of 7.5 mg / ml 2 ml, intramuscular administration, 1-2 ampoules / day (15-30 mg), in courses of 10-30 days, separated by breaks of 10-15 days.
- **Mildronate** 0.5g / 5ml I.V. and 500 mg capsules, intravenous administration of 5

ml once a day for 10 days, then switch to oral administration, 500mg capsules, a capsule of 2-3 times a day for 20 days.

### **Non-steroidal anti-inflammatory drugs**

- **Tenoxicam** (artoxan) 20 mg in 2 ml ampoules, intramuscular administration of 20 mg per day for 7 days.
- **Meloxicam** tablets 7.5 mg, administration of one tablet twice a day for 7 days.
- **Lornoxicam** (xefocam) tablets 8 mg, taking one tablet twice a day for 7 days.
- **Diclofenac sodium** (admiral) 75 mg in 3.0 ml ampoules, intramuscular administration or as infusion solution, once daily for 7 days.

### **Metabolic therapy**

- **Tiamine chloride** (vitamin B1) ampoules of 1.0 ml, intramuscular administration, once a day, for 7 days.
- **Pyridoxine hydrochloride** (vitamin B6) ampoules 1.0 ml, intramuscular administration, once a day, for 7 days.
- **Nicotinic acid** ampoules of 1 ml - 1%, intramuscular administration of 1 ml of 1% solution once a day for 10 days.

### **Antispasmodics**

- **Mebeverine** (duspatalin retard) 200 mg capsules, one capsule twice a day for 5-7 days.

### **Chondroprotective**

- **Glucosamine**, internal administration, one sachet per day for 30 days.

### **Physiotherapeutic procedures:**

- Electrophoresis with 5% novocaine;
- Diathermy of the cervical ganglia;

- UV radiation of the cervical ganglia regions;
- Galvanic baths;
- Ultrasound with hydrocortisone and laser therapy;
- Acupuncture;
- Mineral water bath treatment, with oxygen, mud therapy.

### **Work capacity expertise:**

When establishing the work capacity in vibration disease, the working conditions, the general anamnesis and the professional route, the clinical manifestations and the development of the pathological process will be taken into account.

In the compensated and subcompensated forms of vibration disease the pathological process is usually reversible, the work capacity is limited for a while, but it is restored after the treatment. But, once the pathological process is triggered and the exposure to vibration is continued, the vibration disease will worsen, with the transition to the decompensated form, so resuming work in the same conditions will not be allowed.

After determining the work capacity loss level , in case of incomplete recovery, third degree occupational disease disability is assigned.

Decompensated forms of vibration disease with diffuse polyorganic damage usually lead to stable work capacity loss. These patients are diagnosed with II<sup>nd</sup> or III<sup>rd</sup> group occupational disease disability.

### **Prophylactic measures**

1. Legislative measures (assessment of occupational risk factors and passporting of jobs);
2. Organizational measures;
3. Technological measures;
4. Technical-sanitary measures;
5. Individual protection measures;
6. Medical measures: medical examinations at work, adaptation (after 3 months from

employment), periodically (after one year from employment) and re-employment.

## KNOWLEDGE VERIFICATION QUESTIONS:

### 1. Define vibration.

Vibration is the oscillating movement of a solid body, performed around an equilibrium position, with different frequencies.

### 2. Name and explain the physical characteristics of vibration.

- **Frequency** - the number of oscillations of a solid body in a time unit, expressed in Hz. (1Hz corresponds to one oscillation per second);
- **Amplitude** - the maximum distance from the equilibrium position, which is measured in units of length  
  
(m, dm, cm, mm);
- **Speed** - the product between amplitude and time, which is measured in - m / s;
- **Acceleration** - the product of amplitude and time squared, which is measured in - m / s<sup>2</sup>.

### 3. In which frequency-based groups can vibration be classified?

Depending on the Aristotel Cocârlă 2009 frequency, we can distinguish the following groups:

- Very low frequency vibration - below 2 Hz;
- Low frequency vibration - between 2 and 20 Hz;
- Medium frequency vibration - between 20 and 300 Hz;
- High frequency vibration - between 300 and 1000 Hz, sometimes even up to 5000 Hz and Shaking.

#### **4. Define vibration disease.**

Vibration disease is an occupational disease caused by prolonged exposure (minimum 3 years) to workplace vibrations. Discovering vibrations in the professional route is the most important aspect to confirm the vibration disease.

#### **5. Define the professional route.**

The professional route is an overview, a chronological presentation of all the professional activities, the duration of those that involved significant exposures and references on working conditions. This data is mandatory to confirm or deny an occupational disease.

#### **6. What is specific for the etiology of vibration disease, what is the main etiological factor and where should it be found?**

Vibration disease has a clinical polymorphism with original evolution.

The main etiological factor is represented by the vibrations of different frequencies, which are found in the professional route.

#### **7. What factors can install vibration disease earlier?**

Factors that can install vibration disease earlier are:

- adaptation-compensation capacity (which is the totality of the body's possibilities to correlate its morphological and physiological structures, in order to adjust its functionality, related to changes in living conditions);
- certain cardiovascular diseases;
- diabetes mellitus;
- smoking;
- peripheral vascularization insufficiency;
- Age.

#### **8. What are the harmful factors present in the work environment that can install the vibration disease earlier?**

Harmful factors present in the work environment:

- unfavorable microclimate (humidity, temperature and caloric radiation);

- Comitant noise presence;
- cooling and cold air currents;
- static-dynamic tasks, forced working position.

### **9. What are the specific manifestations of vibration disease?**

Specific manifestations of vibration disease come with:

- affectation of the locomotor and cardiovascular system;
- reflective disorders of the internal organs.

### **10. What are the mechanisms underlying the onset of vibration disease?**

The trigger consists of complicated mechanisms: neurohormonal and reflectors.

### **11. What will the long-term action of vibration on peripheral receptors of vibration sensitivity lead to?**

Long-term action of vibration on peripheral receptors of vibration sensitivity leads to increased excitability of the corresponding centers. Under the action of reflective impulses in the spinal neurons, sympathetic ganglia, in other vegetative formations, reticular formation of the brainstem and cortical regions, response reactions develop.

### **12. Why do pronounced manifestations of angiospasm occur in vibration disease?**

As a result of the CNS regulatory action disturbances on the vascular tone and, in particular, on the regional circuit state, intense manifestations of angiospasm appear. Thus, the deeper the disorders of trepidation sensitivity, the more pronounced the vascular spasm.

### **13. In vibration disease, what will mechanical irritation of the vascular intima lead to?**

Mechanical irritation of the vascular intima will contribute to the aggravation of spasm or atony.

### **14. Trophic disorders in vibration disease, which occurs primarily in the neuro-muscular and locomotor system, which anatomical region is particularly affected?**

Trophic disorders occur primarily in the neuromuscular and locomotor system, especially in the muscles, bones and scapular girdle joints.

**15. Parallel to the progressive decrease of receptivity in vibration disease, what changes are noticed?**

Along with the progressive decrease in receptivity in vibration disease suffers:

- Algesic, tactile and thermal sensitivity, therefore the excitation of the vibrating centers radiates in the neighboring regions, first of all in the vaso-motor centers;
- Conditions the changes in the functional state of the peripheral vessels;
- After the onset of the disease, the excitation is transmitted to the pain and thermal sensitivity centers.

**16. What happens as a result of the decrease in the body's ability to adapt to the action of vibrations?**

As a result of the decrease of the organisms adaptation possibilities and the deterioration of the peripheral and central vegetative formations, the advanced stages of the disease develop the hypothalamic syndrome.

**17. Write the classification of the vibration disease according to the pathological process expression degree .**

Depending on the pathological process expression degree (Z. E. Droghicina and N. B. Metlina, 1959):

- Initial form;
- Medium form;
- "Serious form."

**18. Write the classification of the vibration disease according to the impact region.**

Depending on the anatomical impact region (E. Andreeva-Galanina and V.G. Artamova, 1963):

1. Vibration disease caused by local vibrations;
2. Vibration disease caused by general vibrations;

3. Vibration disease caused by the action of general vibration and shaking.

**19. Write the classification of the vibration disease according to the expression degree of the disease caused by the local vibration.**

Depending on the expansion degree of the disease caused by local vibration (M. Rijikova, V. Artamova, L. Milkov, L. Metlina, 1981):

- I. Initial manifestations, compensated form;
- II. Moderate manifestations, subcompensated form;
- III. Intense manifestations, decompensated form.

**20. Who is the author and what year was the classification of clinical syndromes written? What are the 7 most common clinical syndromes in vibration disease?**

In 1967, the classification perfected by Z. E. Droghicina and N. B. Metlina was proposed, which allowed the highlighting of the seven most common clinical syndromes of the vibration disease:

1. Angiospastic;
2. Angiodystonic;
3. Vegetative polyneuritis;
4. Neuritic;
5. Vegeto-myofascial;
6. Diencephalic;
7. Vestibular.

**21. What are the clinical features of the local vibration caused vibration disease?**

This form of vibration is found in mechanized tools in the work process and are distinguished by these clinical features:

- The disease develops gradually;
- The most important clinical aspect is the peripheral vascular syndrome with pronounced angiospasm;
- The disease often proceeds latently over a longer period of time;

- The latent period can differ from a few months to several years;
- Duration depends on the functional state of the body, the compensatory-adaptive mechanisms state, the physical characteristics of the vibration and its combination with other harmful factors.

**22. What are the peripheral syndromes in the compensated form of the local vibration caused vibration disease?**

Peripheral syndromes in the compensated form of vibration disease caused by the action of local vibration:

- Angiospastic with rare angiospasm;
- Angidystonic;
- Sensory (vegetative-sensory);
- Polyneuropathy of the hands.

**23. What are the compensated symptoms of the local vibration caused vibration disease?**

Symptoms of the compensated form of vibration disease caused by the action of local vibration:

- Spontaneous finger whitening is rare and is observed when washing with cold water and total overcooling;
- Feelings of cold and delayed restoration of the skin temperature of the fingers after exposure to cold;
- Nocturnal or resting hand pain. After 10-15 minutes after beginning to work, the pain usually disappears;
- Slight terminal phalanges sensitivity disorder, paresthesias, an unaccented decrease of the vibration sensitivity and capillary tone change;
- Sometimes mild functional CNS disorders.

**24. What are the peripheral syndromes in the undercompensated form of the local vibration caused vibration disease?**

Peripheral syndromes in the undercompensated form of vibration disease caused by

the action of local vibration:

Peripheral angiospastic:

- With frequent angispasms
- With vegetative trophic disorders

Sensory (vegetative-sensory); polyneuropathy combined with:

- Dystrophic disorders of the hands and scapular girdles locomotor system (vegetomyofasciitis, periarthrosis);
- Functional disorders of the nervous system (neuroasthenic and cerebral angiodystonic syndrome);
- Poliradicular changes (cervical polyradiculopathy).

## **25. What are the compensated symptoms of the local vibration caused vibration disease?**

Symptoms in the undercompensated form of vibration disease caused by the action of local vibration:

- Indisposition, asthenia;
- Vegetative dystonia with unlocalized headache, mild dizziness;
- Sleep disorder and increased irritability;
- Some patients experience pain in the precordial region, palpitations, sweating;
- Painful phenomena and stable paresthesias;
- Tone changing of capillaries and large vessels.

## **26. What are the peripheral syndromes in the decompensated form of the vibration disease caused by the action of local vibration?**

Peripheral syndromes in the decompensated form of vibration disease caused by the action of local vibration:

- It occurs as a sensory-motor polyneuropathy;
- Advanced stages of the disease may include vegetative-vascular disorders with a generalized character;

- Intense vasomotor and trophic disorders.

**27. What are the symptoms in the decompensated form of vibration disease caused by the action of local vibration?**

Symptoms of the decompensated form of vibration disease caused by the action of local vibration:

- Occurrences of peripheral angiospasm become more frequent, the intensity of paresthesias and pain sensations increase, sensitivity disorders worsen, vibration sensitivity is suddenly abolished;
- Most patients have asthenia and vegetative-vascular dystonia;
- Hypertension, myocardial dystrophy, degenerative-dystrophic changes of the scapular girdle, less often of the spine;
- This phase is distinguished by a torpid evolution, the recovery being incomplete, even in case of interrupting the contact with the vibration and applying the treatment.

**28. In which groups can the changes induced in the human body by the vibration disease caused by the action of general vibration be separated?**

Changes induced in the human body by the action of general vibration can be grouped into:

- Mechanical,
- Physiological,
- Psychological.

**29. What is absolutely necessary to establish the connection between the worker's health state and the occupational risk factors to which he has been exposed?**

In order to establish the connection between the health status of the worker and the occupational risk factors to which he has been exposed, it is absolutely necessary to put the occupational route together.

**30. What are the specific syndromes in the compensated form of the vibration disease caused by the action of the general vibration?**

The syndromes of the compensated form of the vibration disease caused by the

general vibration are:

- Angiodystonic syndrome (cerebral or peripheral).
- Vegetative-vestibular syndrome.
- Sensory syndrome.

**31. What are the vibration diseases clinical aspects in the compensated form of the vibration disease caused by the action of general vibration?**

Clinical aspects of the general vibration disease - compensated form:

- Peripheral angiodystonic syndrome with paresthesias and mild pain in the legs associated with muscle cramps. At the same time, there is acrocyanosis, hyperhidrosis, hypothermia in the legs and hands, a spastic-atonic state of the nail bed capillaries. Cerebral angiodystonic syndrome with diffuse headache.
- Vegetative-vestibular syndrome with dynamic ataxia. These patients gradually lose the precision of movements.
- Sensory syndrome with specific pain in the lower extremities, numbness, sometimes burning sensation in the legs.

**32. What are the specific syndromes in the subcompensated form of vibration disease caused by the action of general vibration?**

The syndromes of the subcompensated form of vibration disease caused by general vibration are:

- Angiodystonic syndrome.
- Sensory syndrome, polyneuropathy of the lower extremities combined with:
  - a) polyradicular disorders;
  - b) secondary lumbosacral root syndrome  
(on the background of lumbar osteochondrosis);
  - c) functional disorders of the nervous system.

**33. What are the clinical aspects of vibration disease in the undercompensated form caused by the action of general vibration?**

Clinical aspects of General Vibration Disease - Undercompensated Form:

- Sensory syndrome (polyneuropathy of the lower extremities) in the lower and upper extremities sensory and vegetative-trophic disorders appear. The general vibration leads to direct microtraumatic effects on the spine, the degeneration of the intervertebral disc developing vertebrogenic neurological syndrome, occurs primarily at the lumbosacral level. Root changes continue by developing chronic lumbosacral radiculopathy, with severe pain syndrome and postural myotonia. L4 and L5 roots are most often affected. The development of movement disorders, even paresis, happens more often in the innervation zone of the tibial nerve. The formation of radiculopolyuropathy occurs on the background of degenerative-dystrophic changes in the spine as osteochondrosis, deforming spondylosis and lumbar osteoporosis.
- Angiodystonic syndrome in the undercompensated form of vibration disease the general form is characterized by paresthesias and severe pain in the legs associated with muscle cramps. There is severe acrocyanosis, hyperhidrosis, hypothermia in feet and hands. Cerebral angiodystonic syndrome is manifested with symptoms of diffuse persistent headache.

**34. What are the specific syndromes in the decompensated form of vibration disease caused by the action of general vibration?**

The syndromes of the decompensated form of the vibration disease caused by the general vibration are:

- Sensor-motor polyneuropathy syndrome.
- Discirculatory encephalopathy syndrome combined with peripheral polyneuropathy (encephalopolyneuropathy syndrome).

**35. What are clinical aspects of the vibration disease in the decompensated form of vibration disease caused by the action of general vibration?**

Clinical aspects of the general vibration disease - decompensated form:

- Sensorimotor polyneuropathy syndrome clinically comes with paresis and paresthesias in the lower limbs, associated with persistent edema in the lower limbs. The pain sensations in the legs becomes persistent and there is an accentuation of the feeling of weakness with increased local sensitivity. Patients experience a great difficulty and can lead to local trauma.

➤ Dispirulatory encephalopathy syndrome clinically presents by the following accusations:

h) memory problems, even multiple sclerosis;

i) nausea and vomiting;

j) dizziness;

k) loss of consciousness;

l) movement coordination loss;

m) decreased concentration, problems with thinking;

n) intense nervousness.

➤ Peripheral polyneuropathy is usually manifested bilaterally, symptoms include numbness, paresthesia, burning sensation, vibration in the legs, tingling sensation, severe hyperesthesia and pain. The pain can be deep and it is often more intense at night.

### **36. What is specific about the vibration disease caused by the combined action of vibration and shaking?**

In case of vibration and shaking caused vibration disease, we distinguish:

➤ One of the main syndromes of this pathology is the vegetative-vestibular syndrome, which is manifested by dizziness, headache, nausea.

➤ Most patients have decreased vestibular irritability.

➤ This type of vibration disease is often associated with cerebral angiodystonia.

➤ Dysfunction of the digestive glands, disturbance of gastric secretion can be caused by regulatory defects, by ptosis of the abdominal organs with subsequent irritation of the solar plexus, which develops because of continuous shaking.

➤ Patients who seek medical attention with the aforementioned symptoms must be checked for exposure to general vibration and shaking at work, so the professional route will be documented and analyzed.

### **37. In order to establish a positive diagnosis in vibration disease, what is the first aspect we have to establish?**

In order to establish the clinical diagnosis, it is mandatory to document the PROFESSIONAL ROUTE with details of the professional risk factors evaluated for each job where the suspect has been diagnosed with an occupational disease.

**38. What paraclinical examinations are needed to establish the diagnosis of vibration disease?**

Paraclinical examinations required to establish the diagnosis of vibration disease:

- Evaluation of the clenching fist force with the dynamometer;
- Estentiometry for detecting neurosensory disorders;
- Local contact thermometry;
- Nail bed capilloscopy;
- Blood tests;
- Comparative radiography of the hands;
- Radiography of the spine;
- Blood pressure measurement with the photoplethysmography;
- The cold water immersion test;
- Cold challenge test;
- Infrared thermography;
- Electromyography.

**39. With which diseases is the differential diagnosis of vibration disease made?**

It is mandatory to exclude vasospastic manifestations of another etiology:

- Primary Raynaud's syndrome (Raynaud's disease);
- Secondary Raynaud's syndrome;
- Raynaud phenomenon;
- Syringomyelia;
- Polyuropathies;

- Periarthritis.

**40. What is the prognosis of a patient diagnosed with vibration disease and what factors can it be influenced by?**

The prognosis is generally good, even in the absence of sustained treatment. The prognosis is negatively influenced by young age, smoking, diabetes, coexistence of other vascular diseases and long duration of exposure to high frequency vibrations.

**41. What is the treatment tactic in vibration disease?**

Treatment tactics in vibration disease aim to reduce clinical manifestations, reduce pain intensity, improve nerve activity and reduce vasospasm.

**42. What are the peripheral vasodilators used in the treatment of vibration disease?**

Peripheral vasodilators used in the treatment of vibration disease:

- Pentoxifylline injecting solution of 2% - 5 ml, administrated as an intravenous infusion in 150.0 ml of 0.9% sodium chloride solution, for 10 days.
- Vincamine injecting solution of 7.5 mg / ml 2 ml, intramuscular administration, 1-2 ampoules / day (15-30 mg), in courses of 10-30 days, separated by breaks of 10-15 days.
- Mildronate 0.5g / 5ml injecting solution and 500 mg capsules, intravenous administration of 5 ml once a day for 10 days, then switch to oral administration, 500mg capsules, a capsule 2-3 times a day for 20 days.

**43. What non-steroidal anti-inflammatory drugs are used in the treatment of vibration disease?**

Non-steroidal anti-inflammatory drugs used in the treatment of vibration disease:

- Tenoxicam (artoxan) 20 mg in 2 ml ampoules, intramuscular administration of 20 mg per day for 7 days.
- Meloxicam tablets 7.5 mg, administration of one tablet twice a day for 7 days.
- Lornoxicam (xefocam) tablets 8 mg, taking one tablet twice a day for 7 days.
- Diclofenac sodium (admiral) 75 mg in 3.0 ml ampoules, administered intramuscularly or as a solution for infusion, once daily for 7 days.

**44. What preparations does the metabolic therapy used in the treatment of vibration disease involve?**

Preparations used for metabolic therapy in the treatment of vibration disease:

- Thiamine chloride (vitamin B1) ampoules of 1.0 ml, intramuscular administration, once a day, for 7 days.
- Pyridoxine hydrochloride (vitamin B6) ampoules of 1.0 ml, intramuscular administration, once a day, for 7 days.
- Nicotinic acid ampoules of 1 ml - 1%, intramuscular administration of 1 ml of 1% solution once a day for 10 days.

**45. What antispasmodic is used in the treatment of vibration disease?**

Antispasmodic used in the treatment of vibration disease:

- Mebeverine (duspatalin retard) 200 mg capsules, one capsule twice a day for 5-7 days.

**46. What chondroprotector is used in the treatment of vibration disease?**

Chondroprotector used in the treatment of vibration disease:

- Glucosamine, internal administration, one sachet per day for 30 days.

**47. Which physiotherapeutic procedures are indicated in case of vibration disease?**

- Electrophoresis with 5% novocaine;
- Diathermy of the cervical ganglia;
- Radiation with ultraviolet rays of the regions of the cervical ganglia;
- Galvanic baths;
- Ultrasound with hydrocortisone and laser therapy;
- Acupuncture;
- Treatment with mineral water baths, with oxygen, mud applications.

**48. What criteria will be taken into account for the work capacity expertise in case of vibration disease?**

When establishing the work capacity in vibration disease, the working conditions, the general anamnesis and the professional route, the character of the clinical manifestations and the dynamics of the development of the pathological process will be taken into account.

**49. What is specific, for the work capacity expertise in case of vibration disease, the compensated and subcompensated form?**

In the compensated and undercompensated forms of vibration disease the pathological process is usually reversible, the work capacity is limited for a period of time, but restored after the treatment. Once the pathological process is triggered and the exposure to vibrations continues, the vibration disease will worsen, with the transition to the decompensated form, so resuming work in the same conditions is not allowed.

**50. What degree of invalidity is assigned, in case of the work capacity expertise for vibration disease, the compensated and subcompensated form?**

After determining the work capacity loss level, in case of incomplete recovery, third degree of occupational disease disability is assigned.

**51. What is specific for the work capacity expertise in case of vibration disease, the decompensated form?**

Decompensated forms of vibration disease with diffuse polyorganic damage usually lead to stable loss of work capacity.

**52. What work capacity expertise disability group is attributed in case of vibration disease, the decompensated form?**

These patients are diagnosed with IIrd or IIIrd disability group connected to the occupational disease.

**53. What are the prevention measures for the vibration disease?**

1. Legislative measures (assessment of occupational risk factors and passporting of jobs);
2. Organizational measures;
3. Technological measures;
4. Technical-sanitary measures;

5. Individual protection measures;

6. Medical measures: medical examinations at work, adaptation (after 3 months from work start), periodic (after one year from work start) and re-employment.

## KNOWLEDGE TESTS:

### 1. Define the vibration.

- a. [\*] Vibration is an oscillating movement of a solid body, performed around an equilibrium position , with different frequencies.
- b. [] Vibration is a single motion around an equilibrium position.
- c. [] Vibration is an oscillating movement of a solid body, performed without involving equilibrium positions.
- d. [] Vibration represents sound waves with different frequencies.
- e. [] Vibration is equilibrium movements.

### 2. Name and explain the physical characteristics of vibration.

- a. [\*] Frequency - the number of oscillations of a solid body in a unit of time, expressed in Hz. (1Hz corresponds to one oscillation per second)
- b. [\*] Amplitude - the maximum distance from the equilibrium position, which is measured in units of length (m, dm, cm, mm).
- c. [\*] Speed - the product of amplitude and time, which is measured in - m / s.
- d. [\*] Acceleration - the product of amplitude and time squared, which is measured in - m / s<sup>2</sup>.
- e. [] Acceleration - the product of frequency and time squared, which is measured in - Hz / s<sup>2</sup>.

### 3. In which frequency-based groups can vibration be classified?

- a. [\*] Very low frequency vibration - below 2 Hz.
- b. [\*] Low frequency vibration - between 2 and 20 Hz.

- c. [\*] Medium frequency vibration - between 20 and 300 Hz.
- d. [\*] High frequency vibration - between 300 and 1000 Hz, sometimes even up to 5000 Hz and Shaking.
- e. [] Very low frequency vibration - below 2 Hz and Shaking.

**4. Give the definition of vibration disease.**

- a. [\*] Vibration disease is an occupational disease caused by prolonged exposure (minimum 3 years) to vibrations in the workplace.
- b. [] Vibration disease is an occupational disease caused by prolonged exposure (minimum 30 years) to vibrations in the workplace.
- c. [] Vibration disease is an occupational disease caused by prolonged exposure (minimum 3 years) to household vibration.
- d. [] Vibration is the oscillating movements of a solid body, performed around an equilibrium position, with different frequencies.
- e. [] Vibration is the oscillating movements of a solid body, performed without involving equilibrium positions.

**5. Define the professional route.**

- a. [\*] The professional route is a review, a chronological presentation of all professional activities performed, the duration of those that involved significant exposures and references on working conditions.
- b. [\*] This data is mandatory to confirm or deny an occupational disease.
- c. [] This data is not necessary to confirm or deny an occupational disease.
- d. [] The professional route is a review, a chronological presentation of some professional activities performed.
- e. [] The professional route is a review, a chronological presentation of professional activities performed, but this data is not necessary to confirm or deny an occupational disease.

**6. How is the etiology of vibration disease, what is the main etiological factor and how should it be elucidated?**

- a.  Vibration disease is characterized by a clinical polymorphism with original evolution.
- b.  The main etiological factor is the vibration of different frequency, which is elucidated in the professional route.
- c.  Vibration disease is not characterized by a clinical polymorphism.
- d.  The main etiological factor is represented by vibrations of different frequency, which should not be elucidated in the professional route.
- e.  The main etiological factor is represented by noise of different frequency, which is elucidated in the professional route.

**7. What are the factors that can install vibration disease earlier?**

- a.  adaptive-compensation capacity.
- b.  certain cardiovascular diseases.
- c.  diabetes mellitus.
- d.  smoking.
- e.  old age.

**8. What are the factors that can install vibration disease earlier?**

- a.  adaptive-compensation capacity.
- b.  certain cardiovascular diseases.
- c.  insufficiency of peripheral vascularization.
- d.  young age.
- e.  old age.

**9. What are the harmful factors present in the work environment that can trigger vibration disease earlier?**

- a.  unfavorable microclimate (humidity, temperature and caloric radiation).
- b.  concomitant presence of noise.
- c.  cooling and the presence of cold air currents.

- d.  static-dynamic loads, forced working position.
- e.  cooling and the presence of cold air currents prevent the appearance of the disease.

**10. What are the specific manifestations of vibration disease?**

- a.  affecting the locomotor and cardiovascular system.
- b.  reflective disorders of the internal organs.
- c.  minimal damage to the locomotor and cardiovascular system.
- d.  minimal damage to internal organs.
- e.  minimal damage to the locomotor system.

**11. What are the mechanisms underlying the onset of vibration disease?**

- a.  Triggering has complicated mechanisms: neurohormonal and reflectors.
- b.  There are only complicated mechanisms underlying the trigger: neurohormonal.
- c.  The only triggering mechanism is the trigger: the reflectors.
- d.  The trigger has complicated mechanisms, except for neurohormonal and reflective ones.
- e.  There are no complicated mechanisms underlying the trigger.

**12. What will the long-term action of vibration on peripheral vibration sensitivity receptors lead to?**

- a.  The long-term action of vibration on peripheral receptors of vibration sensitivity creates conditions for increased excitability of the corresponding centers.
- b.  Under the action of reflective impulses in spinal neurons, sympathetic ganglia, in other vegetative formations, reticular formation of the brainstem and cortical regions, response reactions develop.
- c.  The short-term action of vibration on peripheral receptors of vibration sensitivity creates conditions for increased excitability of the corresponding centers.
- d.  The long-term action of vibration on peripheral receptors of very weak vibration sensitivity creates conditions for increased excitability of the corresponding centers.

e.  Under the action of reflective impulses in spinal neurons, sympathetic ganglia, in other vegetative formations, reticular formation of the brainstem and cortical regions, no response reactions are perceived.

**13. Why do intense manifestations of angiospasm occur in vibration disease?**

a. [\*] As a result of the disturbances of the CNS regulatory actions on the vascular tone and, in particular, on the state of the regional circuit, intense manifestations of angiospasm appear.

b. [\*] Thus, the deeper the trepidation sensitivity disorders, the more pronounced the vascular spasm.

c.  As a result of the disturbances of the CNS regulatory actions on the vascular tone and, in particular, on the state of the regional circuit, weakly pronounced manifestations of angiospasm appear.

d.  The deeper the trepidation sensitivity disorders, the less pronounced the vascular spasm.

e.  The short-term action of vibration on peripheral receptors of vibration sensitivity potentially increases the excitability of the corresponding centers.

**14. In vibration disease, what will mechanical irritation of the vascular intima contribute to?**

a. [\*] Mechanical irritation of the vascular intima will contribute to aggravation of spasm or atony.

b.  As a result of the disturbances of the CNS regulatory actions on the vascular tone and, in particular, on the state of the regional circuit, weakly pronounced manifestations of angiospasm appear.

c.  The deeper the trepidation sensitivity disorders, the less pronounced the vascular spasm.

d.  The short-term action of vibration on peripheral receptors of vibration sensitivity creates conditions for increased excitability of the corresponding centers.

e.  Mechanical irritation of the vascular intima will practically not contribute to the aggravation of spasm.

**15. In case of trophic disorders in vibration disease, which occur primarily in the**

**neuromuscular and locomotor system, which anatomical region is particularly affected?**

- a. [\*] Trophic disorders occur primarily in the neuromuscular and locomotor system, especially in the muscles, bones and joints of the scapular girdle.
- b. [] Trophic disorders occur primarily in the neuromuscular and locomotor system, especially in the muscles of the small pelvis.
- c. [] Trophic disorders occur primarily in the neuromuscular and locomotor system, especially in the muscles, bones and joints of the lower limb.
- d. [] Trophic disorders occur primarily in the neuromuscular and locomotor system, especially in the muscles, bones and joints of the forearm.
- e. [] Trophic disorders occur only in muscles.

**16. Next to the progressive receptivity decrease in vibration disease, what other changes are noticed?**

- a. [\*] the algic, tactile and thermal sensitivity, therefore the excitation of the trepidation centers radiates in the neighboring regions, first of all in the vaso-motor centers;
- b. [\*] condition changes in the peripheral vessels functional state;
- c. [\*] after the onset of the disease, the excitation is later transmitted to the pain and thermal sensitivity centers.
- d. [] condition changes in the central vessels functional state;
- e. [] later, after the onset of the disease, excitation is not transmitted to the algic and thermal sensitivity centers.

**17. What happens as a result of the decrease in the body's ability to adapt to vibrations?**

- a. [\*] As a result of the decrease of the adaptation possibilities of the organism and the deterioration of the peripheral and central vegetative formations, in the advanced stages of the disease the hypothalamic syndrome develops.
- b. [] As a result of the decrease of the adaptation possibilities of the organism and the deterioration of the peripheral and central vegetative formations, in the advanced

stages of the disease the cerebellar syndrome develops.

c.  As a result of the decrease of the adaptation possibilities of the organism and the deterioration of the peripheral and central vegetative formations, in the advanced stages of the disease the bipolar syndrome develops.

d.  Due to the decrease of the adaptation possibilities of the organism and the deterioration of the peripheral and central vegetative formations, in the advanced stages of the disease the hypothalamic syndrome no longer develops.

e.  Due to the decrease of the adaptation possibilities of the organism and the deterioration of the peripheral and central vegetative formations, in the advanced stages of the disease the cerebellar syndrome no longer develops.

**18. Classify the vibration disease according to the intensity level of the pathological process.**

a. [\*] Initial form.

b. [\*] Medium shape.

c. [\*] Serious form.

d.  Intermediate form.

e.  Light form.

**19. Classify the vibration disease according to the impact region.**

a. [\*] Vibration disease caused by local vibrations.

b. [\*] Vibration disease caused by general vibrations.

c. [\*] Vibration disease caused by the action of general vibration and shaking.

d.  Vibration disease caused by local vibrations and shaking.

e.  Vibration disease caused by vibration and noise.

**20. Classify the vibration disease according to the intensity level of the disease caused by the local vibration.**

a. [\*] Initial manifestations, compensated form.

b. [\*] Moderate manifestations, undercompensated form.

- c. [\*] Pronounced manifestations, decompensated form.
- d. [] Moderate manifestations, compensated form.
- e. [] Pronounced manifestations, subcompensated form.

**21. What are the most common clinical syndromes in vibration disease?**

- a. [\*] Angiospatic.
- b. [\*] Angiodistonic.
- c. [\*] Vegetative polyneuritis.
- d. [\*] Neuritic.
- e. [] Cerebellos.

**22. What are the most common clinical syndromes in vibration disease?**

- a. [\*] Vegeto-myofascial;
- b. [\*] Diencefalic;
- c. [\*] Vestibular.
- d. [\*] Neuritic.
- e. [] Cerebellos.

**23. What are the clinical features of the vibration disease caused by the action of local vibration?**

- a. [] The disease develops very quickly, practically spontaneously.
- b. [\*] The most important clinical aspect is the peripheral vascular syndrome with pronounced angiospasm.
- c. [\*] Often the disease proceeds latently over a period of time.
- d. [\*] The latent period can differ from a few months to several years.
- e. [\*] The duration depends on the functional state of the organism, the state of the compensatory-adaptive mechanisms, the physical characteristics of the vibration and its combination with other harmful factors.

**24. What are the peripheral syndromes in the compensated form of the local**

**vibration caused vibration disease?**

- a. [\*] Angiospastic with rare angiospasm.
- b. [\*] Angidystonic.
- c. [\*] Sensory (vegetative-sensory).
- d. [\*] Polyneuropathy of the hands.
- e. [] Angiospastic with frequent angiospasm.

**25. What are the compensated symptoms of the vibration disease caused by the action of local vibration?**

- a. [\*] Spontaneous finger whitening, rare, which is observed when washing with cold water and total overcooling;
- b. [\*] Cold sensations and delayed restoration of finger skin temperature after exposure to cold;
- c. [\*] Nocturnal or resting hand pain. After 10-15 minutes from the beginning of work, the pain usually disappears;
- d. [\*] Slight disorder of the sensitivity of the terminal phalanges, paresthesias, an unaccented decrease in vibration sensitivity and change in hair tone;
- e. [] Mandatory, severe CNS functional disorders.

**26. What are peripheral syndromes in the subcompensated form of local vibration caused vibration disease?**

- a. [\*] Peripheral angiospastic.
- b. [\*] Sensory (vegetative-sensory).
- c. [] Severe vasomotor disorders.
- d. [] Accentuated trophic disorders.
- e. [] Mandatory, severe CNS functional disorders.

**27. What are the symptoms of the undercompensated form of local vibration caused vibration disease?**

- a. [\*] Indisposition, asthenia.

- b. [\*] Vegetative dystonia with unlocated headache, mild dizziness.
- c. [\*] Sleep disorder and increased irritability.
- d. [\*] Some patients experience pain in the precordial region, palpitations, sweating.
- e. [] Some patients experience specific pain in the occipital region.

**28. What are the changes in the undercompensated form of local vibration caused vibration disease?**

- a. [\*] Painful phenomena and stable paresthesias;
- b. [\*] Changing the tone of capillaries and large vessels.
- c. [\*] Sleep disorder and increased irritability.
- d. [] Some patients experience specific pain in the occipital region.
- e. [\*] Vegetative dystonia with unlocated headache, mild dizziness.

**29. What are the peripheral syndromes in the decompensated form of local vibration caused vibration disease?**

- a. [\*] Occurs in the form of sensory-motor polyneuropathy.
- b. [\*] In the advanced stages of the disease, vegetative-vascular disorders may have a generalized character.
- c. [] In the advanced stages of the disease, vegetative-vascular disorders may have a localized character.
- d. [\*] Accentuated vasomotor and trophic disorders.
- e. [] Insignificant vasomotor and trophic disorders.

**30. What are the symptoms in the decompensated form of local vibration caused vibration disease?**

- a. [\*] Peripheral angiospasm attacks become more frequent, the intensity of paresthesias and pain sensations increases, sensitivity disorders worsen, vibration sensitivity is suddenly abolished;
- b. [\*] Most patients have asthenia and vegetative-vascular dystonia;
- c. [\*] Hypertension, myocardial dystrophy, degenerative-dystrophic changes of the

scapular belt, less often of the spine;

d. [\*] This phase is distinguished by a torpid evolution, recovery is incomplete, even when interrupting the contact with vibration and application of treatment.

e. [] This phase is distinguished by a rapid evolution, the recovery is complete, even in case of treatment discontinuation.

**31. In which groups can the changes induced by the general vibration caused vibration disease be separated?**

a. [\*] mechanics.

b. [\*] physiological.

c. [\*] psychological.

d. [] physical-physiological.

e. [] mechanical-physical.

**32. What is absolutely necessary in order to establish the connection between the health status of the worker and the occupational risk factors to which he was exposed?**

a. [\*] In order to establish the connection between the health status of the worker and the occupational risk factors to which he has been exposed, it is absolutely necessary to collect the occupational route.

b. [] In order to establish the connection between the health status of the worker and the occupational risk factors to which he has been exposed, it is absolutely necessary to question the employer.

c. [] In order to establish the connection between the health status of the worker and the occupational risk factors to which he has been exposed, it is absolutely necessary to involve the labor inspectorate.

d. [] In order to establish the connection between the health status of the worker and the occupational risk factors to which he has been exposed, it is absolutely necessary to collect the clinical history.

e. [] In order to establish the connection between the health status of the worker and the occupational risk factors to which he has been exposed, it is absolutely necessary

to perform the general clinical examination.

**33. What are the specific syndromes in the compensated form of the vibration disease caused by the action of the general vibration?**

- a. [\*] Angiodystonic syndrome (cerebral or peripheral).
- b. [\*] Vegetative-vestibular syndrome.
- c. [\*] Sensory syndrome.
- d. [] Febrile syndrome.
- e. [] Anemic syndrome

**34. What is the clinic of vibration disease in the compensated form of vibration disease caused by the action of general vibration?**

- a. [\*] Peripheral angiodystonic syndrome is characterized by paresthesias and mild leg pain associated with muscle cramps.
- b. [\*] There is also acrocyanosis, hyperhidrosis, hypothermia in the feet and hands, a spastic-atonie state of the nail bed capillaries.
- c. [] Cerebral angiodystonic syndrome is manifested with paresthesias and mild pain in the legs associated with muscle cramps.
- d. [\*] The vegetative-vestibular syndrome occurs with dynamic ataxia, these patients gradually lose the precision of movements.
- e. [\*] Sensory syndrome occurs with pain in the lower extremities, numbness, sometimes burning sensation in the legs.

**35. What are the specific syndromes in the undercompensated form of vibration disease caused by the action of general vibration?**

- a. [\*] Angiodystonic syndrome.
- b. [\*] Sensory syndrome.
- c. [\*] Polyneuropathy of the lower extremities.
- b. [] Febrile syndrome.
- c. [] Anemic syndrome

**36. What are the clinical aspects of vibration disease in the undercompensated form of vibration disease caused by the action of general vibration?**

- a. [\*] Sensory syndrome (polyneuropathy of the lower extremities) in the lower and upper extremities has sensory and vegetative-trophic disorders.
- b. [\*] The general vibration leads to direct microtraumatic effects on the spine, the degeneration of the intervertebral disc, developing the vertebrogenic neurological syndrome, which primarily takes place in the lumbosacral level.
- c. [\*] Root changes continue by developing chronic lumbosacral radiculopathy, characterized by severe pain syndrome and postural myotonia.
- d. [\*] L4 and L5 roots are most often affected. The development of movement disorders, up to paresis, takes place more often in the innervation zone of the tibial nerve.
- e. [] Cerebral angiodystonic syndrome is manifested by paresthesias and mild pain in the legs in association with muscle cramps.

**37. What are the clinical aspects of vibration disease in the undercompensated form caused by the action of general vibration?**

- a. [\*] Radiculopolyuropathy occurs on the background of degenerative-dystrophic changes in the spine as osteochondrosis, deforming spondylosis and lumbar osteoporosis.
- a. [\*] Angiodystonic syndrome in the undercompensated form of vibration disease the general form specifically occurs with paresthesias and severe pain in the legs associated with muscle cramps.
- b. [\*] There is marked acrocyanosis, hyperhidrosis, hypothermia in the feet and hands.
- c. [\*] Cerebral angiodystonic syndrome occurs with diffuse persistent headache complaints.
- b. [] Cerebral angiodystonic syndrome occurs with paresthesias and mild leg pain associated with muscle cramps.

**38. What are the specific syndromes in the decompensated form of vibration disease caused by the action of general vibration?**

- a. [\*] Sensorimotor polyneuropathy syndrome.

b. [\*] Discirculatory encephalopathy syndrome in combination with peripheral polyneuropathy (encephalopolyneuropathy syndrome).

b. [] Febrile syndrome.

c. [] Anemic syndrome.

d. [] Cerebral angiodystonic syndrome is manifested by paresthesias and mild leg pain associated with muscle cramps.

**39. What are the clinical aspects of vibration disease in the decompensated form caused by general vibration?**

a. [\*] Sensorimotor polyneuropathy syndrome is clinically presented with paresis and paresthesias in the lower limbs, associated with persistent lower limb edema.

b. [\*] The pain sensations in the legs become persistent and there is an accentuated weakness feeling with increased local sensitivity from the beginning. This creates a great difficulty for the patients, later it becomes low and can lead to local trauma.

c. [] Discirculatory encephalopathy syndrome is manifested by paresthesias and mild leg pain associated with muscle cramps.

a. [\*] Peripheral polyneuropathy, in the decompensated form of vibrational disease caused by the action of general vibration, is usually manifested bilaterally, symptoms include numbness, paresthesia, burning sensation, vibration in the legs, tingling sensation, severe hyperesthesia and pain.

b. [] The pain may be superficial, it is often more intense during the day.

**40. What is specific for the vibration disease caused by the combined action of vibration and shaking?**

a. [\*] One of the main syndromes of this pathology is the vegetative-vestibular syndrome, which is manifested by dizziness, headache and nausea.

b. [] Most patients have an increased vestibular irritability.

c. [\*] This type of vibration disease is often associated with cerebral angiodystonia.

d. [\*] Digestive glands dysfunction, disturbance of gastric secretion can be caused by regulatory defects, by ptosis of the abdominal organs with irritation of the solar plexus, which develops because of the continuous shaking.

e. [\*] Patients who seek medical attention with these symptoms must be checked for exposure to general vibration and shaking at work, so the occupational path will be documented and analyzed.

**41. In order to establish a positive diagnosis in vibration disease, what is the most important aspect to establish?**

a. [\*] In order to establish the clinical diagnosis, it is mandatory to document the professional route with the detailing of the professional risk factors evaluated for each job where the suspect has been involved in the occupational disease.

b. [] In order to establish the clinical diagnosis, it is mandatory to establish the worker's way of life.

c. [] In order to establish the clinical diagnosis, it is mandatory to establish the previously known diseases.

d. [] It is not mandatory to document the professional route to establish the clinical diagnosis.

e. [] In order to establish the clinical diagnosis, it is mandatory to establish the employer's opinion on the occupational risk factors evaluated for each job where the suspect has been involved in the occupational disease.

**42. What paraclinical examinations are needed to establish the diagnosis of vibration disease?**

a. [\*] Evaluation of the clenching fist force with the dynamometer.

a. [\*] Steniotometry for the detection of neurosensory disorders.

b. [\*] Local contact thermometry.

c. [\*] Capillaroscopy of the nail fold.

d. [] Contrast-enhanced radiography.

**43. What paraclinical examinations are needed to establish the diagnosis of vibration disease?**

a. [] Contrast-enhanced radiography.

b. [\*] Blood tests.

- c. [\*] Comparative radiography of the hands.
- d. [\*] Radiography of the spine.
- e. [\*] Blood pressure measurement with photoplethysmography.

**44. What paraclinical examinations are needed to establish the vibration disease diagnosis?**

- a. [] Hot water immersion test.
- b. [\*] Cold water immersion test.
- c. [\*] Cold challenge test.
- d. [\*] Infrared thermography.
- e. [\*] Electromyography.

**45. With which diseases is the differential diagnosis of vibration disease made?**

- a. [\*] Primary Raynaud's syndrome (Raynaud's disease).
- b. [\*] Secondary Raynaud's syndrome.
- c. [\*] The Raynaud phenomenon.
- d. [\*] Syringomyelia.
- e. [] Bone tuberculosis.

**46. With which diseases is the differential diagnosis of vibration disease made?**

- a. [\*] Secondary Raynaud's syndrome.
- b. [] Meningitis.
- c. [\*] The Raynaud phenomenon.
- d. [\*] Polyneuropathy.
- e. [\*] Periarthritis.

**47. What is the prognosis of a patient diagnosed with vibration disease and what can influence it?**

- a. [\*] The prognosis is generally good, even in the absence of sustained treatment.

- b. [\*] The prognosis is negatively influenced by young age, smoking, diabetes, coexistence of other vascular diseases and long exposure to high frequency vibrations.
- c. [] The prognosis is generally unfavorable, even in the absence of sustained treatment.
- d. [] The prognosis is positively influenced by young age, smoking, diabetes, coexistence of other vascular diseases and long duration of exposure to high frequency vibrations.
- e. [] The prognosis is unpredictable.

**48. What is the treatment tactic in vibration disease?**

- a. [\*] reducing the clinical manifestations.
- b. [\*] reducing the intensity of the pain.
- c. [\*] improving the nervous activity.
- d. [\*] reducing the vasospasm.
- e. [] inducing vasospasm.

**49. What are the peripheral vasodilators used in the treatment of vibration disease?**

- a. [\*] Pentoxifylline 2% - 5 ml solution for injection, administered as an intravenous infusion in 150,0 ml of 0.9% sodium chloride solution over 10 days.
- b. [\*] Vincamine solution for injection of 7.5 mg / ml 2 ml, intramuscular administration, 1-2 ampoules / day (15-30 mg), in courses of 10-30 days, separated by breaks of 10-15 days.
- c. [\*] Mildronate 0.5g / 5ml solution for injection and 500 mg capsules, intravenous administration of 5 ml once daily for 10 days, then switch to oral administration, 500 mg capsules, one capsule 2-3 times a day for 20 days.
- d. [] Tenoxicam (artoxan) 20 mg in 2 ml ampoules, intramuscular administration of 20 mg per day for 7 days.
- e. [] Meloxicam 7.5 mg tablets, one tablet twice a day for 7 days.

**50. What non-steroidal anti-inflammatory drugs are used in the treatment of**

**vibration disease?**

- a. [\*] Tenoxicam (artoxan) 20 mg in 2 ml ampoules, intramuscular administration of 20 mg per day for 7 days.
- b. [\*] Meloxicam tablets 7.5 mg, one tablet twice a day for 7 days.
- c. [\*] Lornoxicam (xefocam) tablets 8 mg, one tablet twice a day for 7 days.
- d. [\*] Diclofenac sodium (admiral) 75 mg in 3.0 ml ampoules, administered intramuscularly or as a solution for infusion, once daily for 7 days.
- e. [] Mildronate 0.5g / 5ml solution for injection and 500 mg capsules, intravenous administration of 5 ml once daily for 10 days, then switch to oral administration, 500 mg capsules, one capsule 2-3 times a day for 20 days.

**51.What preparations does the metabolic therapy used in treating the vibration disease involve?**

- a. [\*] Thiamine chloride (vitamin B1) 1.0 ml ampoules, intramuscularly administered once daily for 7 days.
- b. [\*] Pyridoxine hydrochloride (vitamin B6) 1.0 ml ampoules, intramuscularly administered once daily for 7 days.
- c. [\*] Nicotinic acid ampoules of 1 ml - 1%, intramuscular administration of 1 ml of 1% solution once a day for 10 days.
- d. [] Mildronate 0.5g / 5ml solution for injection and 500 mg capsules, intravenous administration of 5 ml once a day for 10 days, then switch to oral administration, 500 mg capsules, one capsule 2-3 times a day for 20 days.
- e. [] Tenoxicam (artoxan) 20 mg in 2 ml ampoules, intramuscular administration of 20 mg per day for 7 days.

**52.What antispasmodic is used in the treatment of vibration disease?**

- a. [\*] Mebeverine (duspatalin retard) 200 mg capsules, one capsule twice daily for 5-7 days.
- b. [] Pyridoxine hydrochloride (vitamin B6) 1.0 ml ampoules, intramuscularly administered once daily for 7 days.
- c. [] Nicotinic acid ampoules of 1 ml - 1%, intramuscular administration of 1 ml of

1% solution once a day for 10 days.

d.  Mildronate 0.5g / 5ml solution for injection and 500 mg capsules, intravenous administration of 5 ml once a day for 10 days, then switch to oral administration, 500 mg capsules, one capsule of 2-3 times a day for 20 days.

e.  Tenoxicam (artoxan) 20 mg in 2 ml ampoules, intramuscular administration of 20 mg daily for 7 days.

**53. What chondroprotector is used in the treatment of vibration disease?**

a. [\*] Glucosamine, internal administration, one sachet per day for 30 days.

b.  Pyridoxine hydrochloride (vitamin B6) 1.0 ml ampoules, intramuscularly administered once daily for 7 days.

c.  Nicotinic acid ampoules of 1 ml - 1%, intramuscular administration of 1 ml of 1% solution once a day for 10 days.

d.  Mildronate 0.5g / 5ml solution for injection and 500 mg capsules, intravenous administration of 5 ml once daily for 10 days, then switch to oral administration, 500 mg capsules, one capsule of 2-3 times a day for 20 days.

e.  Tenoxicam (artoxan) 20 mg in 2 ml ampoules, intramuscular administration of 20 mg daily for 7 days.

**54. Which physiotherapeutic procedures are indicated in case of vibration disease?**

a. [\*] Electrophoresis with 5% novocaine.

b. [\*] Diathermy of the cervical ganglia.

c. [\*] UV irradiation of the cervical ganglia regions.

d. [\*] Galvanic baths.

e.  Radon baths.

**55. Which physiotherapeutic procedures are indicated in vibration disease?**

a. [\*] Ultrasound with hydrocortisone and laser therapy;

b. [\*] Acupuncture;

- c.  Treatment with mineral water baths, with oxygen, mud applications.
- d.  UV irradiation of the regions of the cervical ganglia.
- e.  Radon baths.

**56. What criteria will be taken into account for the work capacity expertise of vibration disease?**

- a.  working conditions.
- b.  general history.
- c.  professional route.
- d.  the character of the clinical manifestations and the dynamics of the development of the pathological process.
- e.  health education.

**57. What is specific for the work capacity expertise in case of vibration disease, the compensated and undercompensated form?**

- a.  in the compensated and undercompensated forms of vibration disease the pathological process is usually reversible.
- b.  work capacity is limited for a period of time, which is restored after treatment.
- c.  once the pathological process is triggered and the exposure to vibrations continues, the vibration disease will worsen, with the transition to the decompensated form.
- d.  work capacity is limited for a period of time, which is not restored after treatment.
- e.  Once the pathological process is triggered and the exposure to vibration is continued, the vibration disease will not worsen.

**58. What disability group is attributed according to work capacity expertise in case of vibration disease, the compensated and undercompensated form?**

- a.  After determining the work capacity loss level, in case of incomplete recovery, the third degree occupational disease related disability is assigned.
- b.  After determining the work capacity loss level, in case of incomplete recovery,

the first degree of disability in connection to the occupational disease is assigned.

c.  After determining the work capacity loss level, in case of incomplete recovery, the second degree of disability in connection to the occupational disease is assigned.

d.  After determining the degree of loss of work capacity, in case of incomplete recovery, level IV disability is assigned in connection with the occupational disease.

e.  After determining the loss of work capacity level, in case of incomplete recovery, the group V disability is assigned in connection with the occupational disease.

**59. What is specific, for the work capacity expertise in case of vibration disease, the decompensated form?**

a. [\*] Decompensated forms of vibration disease with diffuse polyorganic damage usually lead to serious loss of work capacity.

b.  Decompensated forms of vibration disease with diffuse polyorganic damage usually do not lead to serious loss of work capacity.

c.  Decompensated forms of vibration disease without diffuse polyorganic damage usually lead to serious loss of work capacity.

d.  Decompensated forms of vibration disease without diffuse polyorganic damage usually do not lead to serious loss of work capacity.

e.  Decompensated forms of vibration disease are not subject to work capacity expertise.

**60. What disability group is assigned, for the work capacity expertise of vibration disease, the decompensated form?**

a. [\*] Group II or III occupational disease related disability is established for these patients.

b.  These patients are diagnosed with group I occupational disease related disability.

c.  These patients are diagnosed with group IV occupational disease related disability.

d.  These patients are diagnosed with group A occupational disease related disability.

e.  These patients do not have an occupational disability group.

**61. What are the measures for preventing the vibration disease?**

- a.  Legislative measures (assessment of occupational risk factors and passporting of jobs).
- b.  Organizational measures.
- c.  Technological measures.
- d.  Technical and sanitary measures.
- e.  Material measures.

**62. What are the measures to prevent vibration disease?**

- a.  Technological measures.
- b.  Technical-sanitary measures.
- c.  Material measures.
- d.  Personal protective measures;
- e.  Medical measures: medical examinations for employment, adaptation (after 3 months from employment), periodic examinations (after one year from employment) and re-employment.

**63. What are the medical measures to prevent vibration disease?**

- a.  a general clinical examination is sufficient.
- b.  adaptation medical examination (after 3 months from employment).
- c.  periodic medical examination (one year after employment).
- d.  medical examination for re-employment.
- e.  medical examination at employment.