Qualitative and Quantitative Characteristics of Pain Syndrome in Hand-Arm Vibration Syndrome

V. Shirokov, I. Krivtsova, H. Bakhtereva,

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Sverdlovsk region

Sverdlovsk region is a territory with the population of 4393000 people (in 2002 – 4986 000 people), the number of working people is 2343000 people, 1307 000 people out of that number have unfavorable work conditions.

96 430 working people are affected by vibration. Generally equipment with higher vibration which is installed in mines for extraction of bauxite, gold, iron and copper ore and others affect upper limbs of miners.
Nociceptive pain
which occurs as a result of tissue disease or damage but in the presence of a functionally intact sensory nervous system

Neuropathic Pain
pain initiated or caused by a primary lesion or dysfunction in the nervous system

Mixed pain
Pain with neuropathic and nociceptive components

“Pain arising as a direct consequence of a lesion or disease affecting the somatosensory system.”

Special Interest Group on Neuropathic Pain (NeuPSIG)
Assessment of Pain Response

Evoked Pain

Quantitative Sensory Testing

Punctate Thresholds

Pressure Pain Thresholds

Thermal Thresholds

Pain Quality Descriptors

McGill

PQAS

S-LANSS

Von Frey filaments

Digital algometer

Peltier thermode

Self-report NP questionnaires
The aim of the present study was to investigate Characteristics of Pain Syndrome in Hand-Arm Vibration Syndrome
METHODS OF RESEARCH

The questionnaires (pain scales):
- Visual Analog Scale (VAS)
- specialized questionnaires screening for neuropathic pain - (DN4)
  - Pain Detect (PD).

Electrophysiological methods:
• electroneurography (ENG):
  - the amplitude of the M-wave,
  - nerve conduction velocity (NCV),
  - latency.
• quantitative sensory testing (QST)
Douleur Neuropathique en 4 questions (DN4)

• This questionnaire consists of two modules: the first module containing 7 questions should be completed on the basis of patient interviewing, and the second module of 3 questions should be completed on the basis of clinical examination. The first module makes it possible to evaluate the positive sensory symptoms. The second module allows physician to identify allodynia and negative sensory symptoms
• If total score is ≥ 4, the patient probably has neuropathic pain.
• Validity of the DN4 Questionnaire has been confirmed by appropriate study. This questionnaire correctly identifies neuropathic pain in 86% of patients and has high sensitivity (82.9%) and specificity (89.9%).

PainDETECT

- This questionnaire is designed for completing by physician and comprises a pain disorder distribution diagram in the form of a picture with VAS scale and the questionnaire designed for identification of spontaneous and induced symptoms of neuropathic pain.

- Also, with the use of the picture, pain monitoring is carried out for identification of persistent, paroxysmal, persistent-with-paroxysms or other type or pain. The questionnaire ensures complete documentation of all the possible parameters of pain and enables one to trace, in the most clear manner, the temporal course of pain syndrome pattern.

- painDETECT Questionnaire sensitivity is 83%.

Quantitative sensory testing (QST)

Computer Aided Sensory Evaluator (CASE IV)

the thermal thresholds (WS),
cold sensitivity (CS),
thermal pain (HP),
cold pain (CP),
vibration sensitivity
The principal symptoms of the neuropathy of the upper limbs (numbness, arthralgia, weakness) among miners
Details of the symptoms (n=26), %

- Itching: 15,0%
- Burning: 15,0%
- Angiospasm (blanching): 38,4%
- Electric shocks: 42,3%
- Tingling: 80,0%
- Neck pain: 92,0%
- Pins and needles: 92,0%
- Numbness: 96,0%
- Pain in articulations of hand: 100,0%
- Painful cold: 100,0%
The biggest number of experienced workers give positive answers to the questions on VAS and DN4 as they have a motivation to get social benefits ("yellow flags")
Change in sensation (Heat, Cold)

- Cold Sensation (n.median right)
  - Value: 29.4
- Cold Sensation (n.median left)
  - Value: 29.4
- Cold Sensation (n.ulnar right)
  - Value: 29.1
- Cold Sensation (n.ulnar left)
  - Value: 29.1
- Warm Sensation (n.median right)
  - Value: 35.7
- Warm Sensation (n.median left)
  - Value: 35.7
- Warm Sensation (n.ulnar right)
  - Value: 35.4
- Warm Sensation (n.ulnar left)
  - Value: 35.4

Normal range and actual values (mean) are shown with p-values indicating statistical significance:

- p=0.000*
- p=0.001**
- p=0.012*
- p=0.002*
- p=0.000**
- p=0.001**
Change in pain threshold (Heat, Cold) (One-sample Test)

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<th>Normal range</th>
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p=0.000**

p=0.023*

p=0.000**
Standardized hand test sites. For dermatomal testing: C6-thumb (A) C7-middle (C) and C8-little finger (E)
Significant negative correlation between questionnaires (Pain Detect) and QST (Cold Sensation) (Sperman`s rho: $r=-0.452^*, p=0.02$)

$r$ - correlation coefficient, $p$ - sig.(2-tailed)
Significant positive correlation between questionnaires PD and QST (Warm Sensation)

(Sperman`s rho: r=0.635**, p=0,000)

$r$ - correlation coefficient, $p$ - sig.(2-tailed)
Significant positive correlation between questionnaires

DN 4 and ENG (sensory NCV)

(Sperman’s rho: \( r=0.530^*, p=0.005 \))

\[ r \] - correlation coefficient, \( p \) - sig.(2-tailed)
Significant negative correlation between sensory NCV and QST (Warm Sensation)

(Sperman’s rho: $r=-0.719^*, p=0.045$)
Significant negative correlation between ENG (sensory NCV) and QST (Vibration threshold)

(Sperman`s rho: $r=-0.409^*, p=0.038$)
CONCLUSIONS

- Patients with HAVS have threshold shifts in temperature, vibration and pain sensitivity which correlate with the pain threshold.
- In the structure of pain syndrome of QST patients there is a neuropathic component which is proved by the testing results, the QST and ENG data.
- The received QST and ENG data prove mainly sensory character of vibration neuropathy.
The received results confirm a difficult structure of a chronic pain syndrome in vibration induced hand disorders.

Complex usage of pain questionnaires and quantitative sensory testing allows to specific components of a chronic pain syndrome and can contribute to optimization of therapeutic tactics (including medicamentary correction).
“Describing pain only in terms of its intensity is like describing music only in terms of its loudness”

von Baeyer CL; Pain Research and Management 11(3) 2006; p.157-162
PALDIES
PAR KLAUSĪŠANĀS !