CPM in a glance

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1. What is CPM?

Conditioned pain modulation (CPM) is a psychophysically-based laboratory method to evaluate the individual capabilities to inhibit (decrease) pain in humans. The CPM bases on "pain inhibits pain" phenomenon when Stimulus A (test-pain) given together with Stimulus B (conditioning pain) is perceived less painful than when Stimulus A was given alone.

The extent of pain reduction represents the value of CPM efficiency and has sign of "minus": in case if no pain decrease was observed, the value of CPM is positive and it is considered as less-efficient CPM.

2. Why is CPM important?

It is known that the same disease or injury cause different pain levels in different people. The question is why? One way to explain this is via pain modulation. How does the nervous system of different individuals handle painful stimuli? The process of pain-inhibits-pain is a way to reflect an important mechanism of pain processing – the inhibitory mechanism. All people have a pain inhibition mechanism. The question is how well does this mechanism work. We know that the ability to inhibit pain in the lab reflects different clinical aspects of pain. For example, the tendency to develop post-operative chronic pain, responsiveness to a certain drug, etc'.

3. What are the potential clinical applications of CPM?

CPM is an easy-to-perform lab test; its results reflect the efficiency of endogenous (internal) mechanisms of pain attenuation. Less-efficient CPM (reduced ability to reduce one experimental pain by other) was widely reported for various chronic pain states such as fibromyalgia, osteoarthritis and other muscle pain; various types of headache including migraine; irritable bowel syndrome, temporomandibular joint disorder, pancreatitis, whiplash and neuropathic pain. Despite that it is still a matter of debates what comes first – pain experience or deficient CPM, results of several studies reported on CPM increase following pain treatment.

The most significant area of clinical application is pain treatment – deciding on the most suitable drug according to the defective pain inhibition mechanism as tested with CPM. Until now, treating neuropathic pain is through trial and error. The physician would recommend one type of drug and it would take weeks or even months until one could decide whether the drug is efficient or not. Drugs that restore deficient central (brain and spinal cord) level of neurotransmitters related with less-efficient CPM are supposed to bring more pain relief to those patients with less-efficient CPM, and will have no effect on patients with the efficient CPM. Thus, pre-treatment assessment of CPM may help the doctor choose the most optimal individual mechanism-based treatment of pain.

The second important possible clinical application is predicting future pain. CPM has the ability to predict the acquiring of future pain. Less-efficient CPM predicted higher incidence of chronic pain after thoracic, abdominal and gynecological surgery. Thus, via the CPM assessment the doctor can identify patients with high risk of suffering from post-surgical pain, and thus to offer the appropriate treatment.

4. What important CPM studies were done, and what are the common CPM protocols used so far?

The issue of CPM, its underlying physiological mechanisms and clinical value are very intensively studied in last several years. One of the important but still opened question relates to the 'best' CPM methodology (a combination of certain type of test-pain with certain type of conditioning pain; stimuli intensity, body site application as well as stimulus duration) that would best contribute to the predictive value of the CPM assessment. There are many studies which concentrated on different methodological properties; however the optimal stimulation protocol for clinical setup is not yet established. The common protocol involves heat or pressure pain conditioned to hand immersion onto hot or cold water noxious water. The most important clinical studies on CPM implied the protocol with noxious contact heat as a test-pain, and hot water immersion as a conditioning pain; this combination predicted successfully the chances to acquire chronic pain after chest surgery, and to develop pain after gynecological surgery. The same CPM protocol tested before chronic pain treatment was superior to predict the analgesic efficacy of Cymbalta, a well-used medication for neuropathic pain treatment. In addition to the described protocol, a CPM response evoked by application of pressure pain stimuli together with hand immersion to the cold pain was a good predictor to develop chronic pain after abdominal surgery. In addition, a CPM response evoked by application of brief electrical stimuli with cold water hand immersion was useful for prediction of the analgesic efficacy of pain medication Pregabaline.

5. What are the advantages of using a two thermode system?

The advantage of using two-thermodes CPM system is computerized control over the stimuli which is impossible using water bath. In contrast to CPM protocols that involve water immersion, using two-thermodes system opens a possibility to test a patient in lying position. It is portable and easy to be carried away from one place to the other. This CPM assessment method is easy-to-perform, and the thermodes can easily be disinfected.