DIFFERENTIATING NOCICEPTIVE MECHANISMS USING ELECTROCUTANEOUS DETECTION THRESHOLDS

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ABSTRACT

Chronic pain after surgery is a frequent problem and difficult to treat. Patients at risk are not identified until early treatment is no longer effective. Persisting and chronic pain can be the result of the malfunctioning of nociceptive mechanisms; both ascending and descending pathways can, individually, attribute to chronic pain development [1]. Pain thresholds measured before and after surgery demonstrated a predictability for post-surgical chronic pain [2], but more evidence is required before it can be used for identification of patients at risk in clinical practice. Moreover, existing methodology does not discriminate between ascending and descending mechanisms. Here, we present psychophysical methods which could help improve the understanding of nociceptive malfunction in persistent post-surgical pain.

Single nociceptive detection thresholds can be estimated from (binary) responses to electrical stimuli and are useful to obtain information about the current state of the nociceptive system [3]. As the processing of a stimulus depends on its temporal parameters (such as pulse width, number of pulses, or inter-pulse interval), different parameters results in different detection thresholds, governed by the processing characteristics [4]. Hence, simultaneous estimation of multiple thresholds could provide information about underlying processing mechanisms.

In previous studies, we demonstrated that our multiple thresholds tracking paradigm is capable of observing several nociceptive phenomena. Varying temporal stimulus properties resulted in different psychophysical functions, each related to different underlying mechanisms. A temporary change in central mechanisms was observed during the application of a painful conditioning stimulus. Moreover, long lasting peripheral and central changes were observed after epidermal nerve defunctionalisation caused by temporary application of a high dose capsaicin patch.

REFERENCES

1. Wilder-Smith, O.H., et al., *Patients with chronic pain after abdominal surgery show less preoperative endogenous pain inhibition and more postoperative hyperalgesia: a pilot study.* Journal of pain & palliative care pharmacotherapy, 2010. **24**(2): p. 119-28.
2. Yarnitsky, D., *Conditioned pain modulation (the diffuse noxious inhibitory control-like effect): its relevance for acute and chronic pain states.* Current Opinion in Anesthesiology, 2010. **23**(5): p. 611-615.
3. Pud, D., Y. Granovsky, and D. Yarnitsky, *The methodology of experimentally induced diffuse noxious inhibitory control (DNIC)-like effect in humans.* Pain, 2009. **144**(1-2): p. 16-9.
4. van der Heide, E.M., et al., *Single pulse and pulse train modulation of cutaneous electrical stimulation: a comparison of methods.* Journal of Clinical Neurophysiology, 2009. **26**(1): p. 54-60.