Functional exploration for neuropathic pain

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With 7 Figures

Contents

Abstract ................................................................. 26
Abbreviations .......................................................... 27
Introduction .............................................................. 27
The lower limb flexion reflex ........................................ 27
   General considerations ........................................... 27
   RIII reflex changes in neuropathic pain induced by supraspinal lesions ........................................... 28
   RIII reflex changes in neuropathic pain induced by spinal cord lesions ........................................... 29
   RIII reflex and non-pharmacological analgesic techniques ......................................................... 30
Evoked potentials in the assessment of neuropathic pain ............ 31
   General considerations ........................................... 31
   SEP in the assessment of NP .................................... 32
   LEP in the assessment of NP .................................... 35
      Physiology, component structure and brain generators of LEPs .................................................. 35
      Clinical use of LEPs ............................................. 36
Brain imaging in neuropathic pain .................................. 42
   Cerebral blood flow (CBF) studies ............................ 42
   CBF studies using PET ........................................... 42
   Studies using fMRI ............................................... 42
   Brain responses to pain ......................................... 43
Abstract

Neuropathic pain (NP) may become refractory to conservative medical management, necessitating neurosurgical procedures in carefully selected cases. In this context, the functional neurosurgeon must have suitable knowledge of the disease he or she intends to treat, especially its pathophysiology. This latter factor has been studied thanks to advances in the functional exploration of NP, which will be detailed in this review. The study of the flexion reflex is a useful tool for clinical and pharmacological pain assessment and for exploring the mechanisms of pain at multiple levels. The main use of evoked potentials is to confirm clinical, or detect subclinical, dysfunction in peripheral and central somato-sensory pain pathways. LEP and SEP techniques are especially useful when used in combination, allowing the exploration of both pain and somato-sensory pathways. PET scans and fMRI documented rCBF increases to noxious stimuli. In patients with chronic NP, a decreased resting rCBF is observed in the contralateral thalamus, which may be reversed using analgesic procedures. Abnormal pain evoked by innocuous stimuli (allodynia) has been associated with amplification of the thalamic, insular and SII responses, concomitant to a paradoxical CBF decrease in ACC. Multiple PET studies showed that endogenous opioid secretion is very likely to occur as a reaction to pain. In addition, brain opioid receptors (OR) remain relatively untouched in peripheral NP, while a loss of ORs is most likely to occur in central NP, within the medial nociceptive pathways. PET receptor studies have also proved that antalgic Motor Cortex Stimulation (MCS), indicated in severe refractory NP, induces endogenous opioid secretion in key areas of the endogenous opioid system, which may explain one of the mechanisms of action of this procedure, since the secretion is proportional to the analgesic effect.

Keywords: Neuropathic pain; flexion reflex; endogenous opioid system; positron emission tomography; motor cortex stimulation; fMRI; SEP; LEP.