

# The new micropatterned interdigitated electrode for selective assessment of the nociceptive system

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## Abstract

**Background:** In this neurophysiological study, we aimed at verifying the nociceptive selectivity of the new, micropatterned electrode (150IDE), recently designed to generate an electric field limited to the intraepidermal free nerve endings.

**Methods:** Using the new 150IDE, we recorded evoked potentials after stimulation of the face and hand dorsum in 22 healthy participants and in patients with exemplary conditions selectively affecting the nociceptive system. We also measured the peripheral conduction velocity at the upper arm and verified the nociceptive selectivity of 150IDE assessing the effect of a selective block of nociceptive nerve fibres of radial nerve with local anaesthetic infiltration. In healthy participants and in patients, we have also compared the 150IDE-evoked potentials with laser-evoked potentials.

**Results:** In healthy participants, the 150IDE-evoked pinprick sensation and reproducible scalp potentials, with latency similar to laser-evoked potentials. The mean peripheral conduction velocity, estimated at the upper arm, was 12 m/s. The selective nociceptive fibre block of the radial nerve abolished the scalp potentials elicited by the 150IDE stimulation. In patients, the 150IDE-evoked potentials reliably detected the selective damage of the nociceptive system.

**Conclusions:** Our neurophysiological study shows that this new 150IDE provides selective information on nociceptive system.

**Significance:** 150IDE is a promising new tool for investigating nociceptive system in patients with neuropathic pain.

## KEYWORDS

neuropathic pain, pain, small-fibre neuropathy

## 1 | INTRODUCTION

The current neurophysiological assessment of the nociceptive system function relies on recording heat-mediated evoked potentials, i.e. laser-evoked potentials and contact heat-evoked potentials, both mediated by A $\delta$ -fibres (Cruccu et al., 2008; Haanpaa et al., 2011; Garcia-Larrea, 2012; Treede, Lorenz,

& Baumgärtner, 2003; Truini et al., 2007; Hüllemann et al., 2019). Although the nociceptive specificity and the diagnostic accuracy of these two techniques are widely agreed, their clinical usefulness is currently limited due to their high cost and the possible safety concerns for laser stimulation.

Over the last years, clinical research has devised special surface concentric electrodes (consisting of a central cathode