Fast-acting sub-perception therapy

Fast-acting sub-perception therapy is a modern approach in neurostimulation, particularly used in chronic pain treatment. This therapy delivers electrical stimulation to the nerves or spinal cord, but at intensities below the level that the patient can consciously perceive—hence “sub-perception.” The goal is to achieve pain relief without the tingling or paresthesia sensations that are common in traditional spinal cord stimulation (SCS).

Key Features

Sub-perception Stimulation:

Traditional spinal cord stimulation often causes a tingling sensation (paresthesia) that patients feel as part of their pain relief process. Sub-perception therapy, however, operates at lower intensities, so the patient does not feel the stimulation but still experiences pain relief.

Fast-acting:

One of the notable advancements in this therapy is that it acts quickly to provide pain relief, often within minutes or hours of initiating therapy. This is a significant improvement over older forms of neuromodulation, which could take days or weeks to show results.

Mechanism:

The exact mechanisms are not fully understood, but it is believed that sub-perception therapy modulates neural pathways and alters the transmission of pain signals to the brain, without requiring strong, perceptible stimulation.

Advantages:

No Paresthesia: Patients do not feel the tingling sensations that can be bothersome in traditional stimulation.

Faster Relief: Unlike older forms of spinal cord stimulation, which may take longer to relieve pain, fast-acting sub-perception therapy works quickly.

Patient Comfort: Since there is no sensory feedback from the therapy, patients often find it more comfortable and easier to tolerate.

Applications:

Chronic Pain Management: The primary use of this therapy is for chronic pain conditions, such as neuropathic pain, back pain, and leg pain, where other treatments may not be effective. Spinal Cord Stimulation (SCS): In SCS, sub-perception therapy is increasingly being used to enhance the effectiveness of the treatment by providing quicker, more consistent relief without side effects.

Clinical Examples:

Burst Stimulation: One form of fast-acting sub-perception therapy is burst stimulation, which delivers electrical pulses in groups or “bursts” rather than in a continuous manner. This approach can be both fast-acting and imperceptible to patients.

High-Frequency Stimulation: Another approach is high-frequency stimulation, such as 10 kHz therapy, which operates at frequencies so high that the patient does not feel any stimulation yet receives significant pain relief.

Fast-acting sub-perception therapy represents a major advancement in neurostimulation for pain management, offering patients a more comfortable experience with quicker results compared to traditional spinal cord stimulation. It is a promising option for individuals seeking relief from chronic pain without the discomfort of paresthesia.

Case reports

A 76-year-old woman presented with a history of several years of bilateral upper extremity and chest-back pain. CM-1 and syringomyelia were diagnosed. The pain proved drug resistant, so foramen magnum decompression (FMD) was performed for pain relief. After FMD, magnetic resonance imaging showed shrinkage of the syrinx. Pain was relieved, but bilateral finger, upper arm and thoracic back pain flared-up 10 months later. Due to pharmacotherapy resistance, SCS was planned for the purpose of improving pain. A percutaneous trial of SCS showed no improvement of pain with conventional SCS alone or in combination with Contour™, but the combination of FAST™ and Contour™ did improve pain. Three years after FMD, percutaneous leads and an implantable pulse generator were implanted. The program was set to FAST™ and Contour™. After implantation, pain as assessed using the McGill Pain Questionnaire and visual analog scale was relieved even after reducing dosages of analgesic. No adverse events were encountered.

Percutaneously implanted SCS using FAST™ may be effective for refractory pain after FMD for CM-1 with syringomyelia [1)]

1)
Yamana S, Oiwa A, Nogami R, Fuga M, Kawamura D, Nakayama Y, Sano T, Murayama Y, Ohashi H. Successful spinal cord stimulation using fast-acting sub-perception therapy for postoperative neuropathic pain of syringomyelia with Chiari malformation type 1 a case report and literature review. BMC Neurol. 2024 Aug 13;24(1):284. doi: 10.1186/s12883-024-03789-8. PMID: 39138444.