

## Neutralising Pain with Neuromodulation

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It sounds simple when we say that 'pain' is a message from the body to the brain that something is not right, but for anyone who has experienced serious pain, including chronic pain, there's nothing simple about it. Though research has made strides in understanding pain, it remains a complex and individualised challenge for those coping with injuries, illnesses and disease.

The International Pain Society and Global Health Community has stated that "failure to treat pain is viewed worldwide as poor medicine, unethical practice, and an abrogation of a fundamental human right."

A recent survey conducted by the World Health Organisation (WHO) in 15 centres across Asia, Africa, Europe and the US has revealed prevalence of chronic pain among 33 per cent of the population. Surveys from India across eight cities have unveiled the prevalence of chronic pain in 13 per cent of our population, which is huge.

Unlike most 'known' illnesses, chronic pain does not get the recognition it deserves. Every patient is different and the type, amount and frequency of pain is unique to the individual, and thus the condition can be difficult to understand and manage. The interplay between physical sensation and the pain experienced by an individual is difficult for another to perceive.

Studies have shown that chronic pain is a common problem in ageing populations, with varying levels of functional and psychological impairment. Because of the increasing demand for public healthcare services and the lack of awareness of pain management in the society, many patients fail to receive the right treatment.

Adding on, chronic pain can be continuous or episodic. It comes in many different forms, making it extremely difficult to classify. Sometimes it directly relates to specific illnesses like chronic inflammatory disease or cancer, while at other times it has no clear identifiable biological origin. More commonly though, chronic pain arises from nervous system dysfunction.

As a result, neuromodulation and neurostimulation are becoming expanding areas of medicine for chronic pain management. While doctors have used neurostimulation for pain since the 1960s, neurostimulation devices and protocols are now evolving in the quest to offer robust pain relief without side effects.

While neuromodulation works by either actively stimulating nerves to produce a natural biological response or by applying targeted pharmaceutical agents in tiny doses directly to the site of action, neurostimulation devices involve the application of electrodes to the brain, the spinal cord or peripheral nerves.

One of the most common neurostimulation techniques for chronic pain is spinal cord stimulation, in which lead wires with electrodes are placed in the epidural space between the vertebrae and the spinal cord. Connected to these leads is a small pulse generator placed under the skin, similar to a pacemaker. A handheld controller can be used to change stimulation parameters.

An example of neuromodulation is the intrathecal pump, which is a device designed to deliver a desired medication directly into the spinal fluid surrounding the spinal cord. This technique allows a drug to be administered in much smaller doses, because it does not have to be metabolised through other body systems before reaching the target area.

Besides neuromodulation and neurostimulation based techniques, new and emerging targets like the dorsal root ganglion, as well as high-frequency and patterned stimulation methodologies such as burst stimulation, are paving the way for better clinical outcomes. As we look forward to 2023, neural sensing, novel target-specific stimulation patterns, and approaches integrating bioengineering into neuromodulation and clinical medicine, are likely to make a significant impact. Moreover, select biomarkers may influence and guide the use of neuromodulation and help objectively demonstrate efficacy and outcomes.

However, this space is hugely dominated by international medical technology players where India would need to make its place very soon by developing indigenous solutions.

Dr Manbeena Chawla

Executive Editor, BioSpectrum