

Therapeutic Neurostimulation – An Overview

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All levels of the nervous system can be stimulated therapeutically. Although spinal cord stimulation (SCS) for pain has held centre stage for most of the last 40 years, peripheral nerve stimulation (PNS) came first. PNS has been much less successful than SCS but interest in it has been rekindled recently. Deep brain stimulation (DBS) for pain became popular in the 1970s but the variable results led to the demise of this invasive treatment although it, too, is now being revisited. In contrast, DBS for movement disorders is now developing rapidly and exciting new applications of DBS e.g some forms of severe mental disorder, are now being explored. For nerve root stimulation, the evolution has been in the opposite direction in that sacral root stimulation has been applied for many years for its motor effects on the bladder and micturition but more recently it has been found to have a promising role in the management of lower extremity and perineal pain and for the excruciatingly painful condition, interstitial cystitis. Cranial nerves can also be stimulated therapeutically; vagal nerve stimulation has emerged recently as a treatment for intractable epilepsy and it may have a role in treating depression. Cerebellar cortex stimulation came and went but was very effective in some cases of intractable epilepsy and had a useful motor effect in some cases of spasticity and dystonia. Finally, the cerebral motor cortex was identified as a target for stimulation in 1991 and its stimulation can be very effective against certain central pain syndromes which cannot be treated in any other way.

The history of spinal cord stimulation illustrates well the problem of getting technology into clinical practice. It nearly died out after 10 to 12 years through poor methodology, unreliable equipment and a lack of understanding of its indications. Its use in motor disorders did die out but an appreciation of its efficacy in neuropathic pain and ischaemic pain, combined with better studies and better hardware took it to a \$200 million a year business by the year 2000. Exciting and diverse new indications are on the horizon including gastrointestinal dysmotility syndromes, cerebral ischaemia and even severe bronchospasm.

However exciting the prospects may be for the field, clinical application will always be limited by socio-economic factors and evidence is increasingly demanded to justify the expenditure. There is undoubtedly a shortage of high level evidence and there is considerable room for improvement in the future. In addition to improvements in methods of outcome assessment and in the structuring of studies, our understanding of the mechanisms of action of SCS is increasing steadily. For some indications, stimulation should not be regarded as a last resort. There are some conditions where earlier stimulation may change the course of the disease. We are ready for a leap forward in the technological aspects but their application will depend upon our ability to convince health care commissioners of their value.