



Chronic Pain: Neurosurgical Perspectives

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Surgery is usually used as a last resort in pain management, after failure of medical treatment. Neurosurgical procedures involve in pain management can be divided into two groups, ablative and augmentative.

Ablative procedures

These procedures aim to reduce the source of pain production or disconnect the pain stimulation along the sensory pathways. Excision of neuromas is a common procedure to reduce pain after peripheral nerve injury. Spinal cord destructive procedures, namely cordotomy had been previous used as the treatment for patients with terminal malignancy, with complications including urinary retention, hemiparesis, and unmasking of contralateral pain.¹ Other complications includes injury to the spinothalamic tract in the cervical cord, which affect breathing. The nonpermanent nature of the pain relief (which may be lost after 1-2 years) or the possibility of inducing deafferentation pain (if the lesion affects the nociceptive pathways) makes destructive procedures not suitable for noncancerous chronic pain.² Another ablative procedure includes hypophysectomy, which significantly reduces pain in terminal cancer patients. Previously, it was done via transsphenoidal route under general anaesthesia. Currently radiosurgery can be used for hypophysectomy to reduce the risk of open operation and general anaesthesia.

Augmentative procedures

With the advance in computer and electronics technology, mini stimulator is now available for implantation. The use of stimulation of dorsal column of spinal cord was first started in the 1960s,³ it was not popular because of absence of appropriate hardware for chronic stimulation. The proposed explanation of the mechanism is based on the gate control theory of pain, which states that stimulation of large A fibres can reduce input signals from small C fibres which reduce the subsequent pain transmission to the central nervous system.⁴ Nowadays, dorsal column stimulation is widely used for neuropathic pain (due to abnormal firing of the neurons despite the irritating source may be absent) of spinal origin that is refractory to drug treatment. Patients selected for implantation procedures will have a trial implantation under local or general anaesthesia with either percutaneous fluoroscopic guidance or open laminectomy to implant the trial lead. The trial lead will be externalised and connected to a temporary stimulator. Various combinations of lead contact, polarity, stimulation current, frequency and pulse width can be adjusted to obtain a good cover of the painful area. The test will last for a few days. If there is

satisfactory response, the lead and the pacemaker will be implanted subcutaneously. Otherwise the lead will be removed. Other indications for dorsal column stimulation include pain reduction in angina pectoris and ischaemic limbs are still controversial.⁵

For nociceptive pain, which is due to continuous pain stimulation from an irritating source, narcotics are the drugs of choice. In the presence of the blood brain barrier, the amount of drugs that reaches the central nervous system (CNS) is much reduced. Direct admission of narcotics to the CNS decreases the dose required and hence reduces systemic side effects. However, it requires a meticulous control of the rate of delivery, as overdose will result in respiratory suppression and mortality. Currently the availability of programmable pumps allows continuous infusion with flow rate control. The same apparatus can be used for baclofen infusion to reduce spasticity and pain related to muscle spasm.

Deep brain stimulation had been used for pain reduction and various targets had been proposed. Periventricular gray (PVG) and periaqueductal gray (PAG) were the targets for nociceptive pain, while ventropostero-lateral nucleus (VPL) and ventralis posteromedialis (VPM) in the thalamus is used for bodily pain and facial pain respectively. For patients with mixed pain, implantation of various targets simultaneously was tried with promising results.⁶

Motor cortex stimulation (MCS) was first reported in 1991.⁷ It was used mainly for thalamic pain, secondary to stroke. It was also useful in central facial pain, with outcomes as high as 83% pain reduction in 77% of patients.⁸

In summary, with the advance in computer and electronics technology, augmentative procedures have replaced ablative procedures in the management of patients with chronic pain.

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