Implanted peripheral nerve stimulator – Another weapon for managing pain

To the Editor,

Percutaneous nerve stimulation (PNS) is a neuromodulation technique which has been used successfully in managing acute postoperative pain and chronic pain due to varied etiologies. There has been significant research done in the field of pharmacology for treating chronic pain. Several drugs targeting specific receptors have been developed and used. However, pain continues to be perplexing as a syndrome for clinicians. Drugs specific for certain subset of receptors or having unique mechanism of action have not been successfully used in managing complex chronic pain syndromes.[1]

Several difficult-to-treat chronic pain situations such as trigeminal neuralgia, complex regional pain syndromes, postamputation pain, posthemiplegia pain, peripheral nerve dysfunctions, fibromyalgia, and several other conditions where oral medications, physical activity, and transcutaneous electrical nerve stimulation (TENS) have failed to treat symptoms have been successfully treated with PNS. The possible mechanism of action of PNS is the gate control theory. On stimulation, large-diameter fibres that transmit sensory impulses close the “gates” owing to the nociceptive input which is transmitted by the small-diameter fibers. Other
possible mechanisms are direct modulation of wide-dynamic range neurons, by modulating activity in cortical and subcortical brain regions and by activation of descending inhibitory pathways.[5]

The stimulating electrode can be placed in or around the muscle/nerve, usually 1–3 cm from the target surgically/percutaneously or using ultrasound. There are two stages involved in the implantation of stimulating electrode. Initially, the electrodes can be tested by placing it at the desired site using an epidural needle. Once the efficacy is established, the electrodes can then be connected to an external battery source (implanted) to generate current for stimulation [Figure 1]. The advantages of this modality are that a continuous supply of local aesthetic is not required, it is opioid-free, can be kept for a longer duration, and does not come out on its own accidentally like the peripheral nerve catheters.[5] US Food and Drug Administration (US-FDA) has cleared the use of this neuromodulation technique which involves placement of a lead percutaneously and a stimulator for managing intractable chronic pain, posttraumatic pain, and chronic pain of peripheral nerve origin.

Right now, the literature supporting long-term efficacy of using implanted PNS in chronic pain is limited. Presently, data are available in the form of case reports and case series which have attested its efficacy and safety. Till date, the implantable PNS has been used for managing postoperative pain (hallux osteotomy, knee arthroplasty), hemiplegic shoulder pain, traumatic shoulder pain, and chronic pain of peripheral nerve origin.

To conclude, PNS with stimulating electrode appears to be an effective and safe modality to treat meticulously selected acute and chronic pain which could not be managed with all approved medications and therapies. Patients should be thoroughly screened and evaluated prior to considering for a PNS with implantable electrode. In the era of opioid-free or opioid-sparing multimodal analgesia strategies, implanted PNS is a new weapon in the armamentarium which needs to be evaluated in well-designed, prospective studies.

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Conflicts of interest
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An algorithm for management of intraoperative subcutaneous emphysema during robotic surgery

Sir,

Subcutaneous emphysema (SCE), also called surgical emphysema, is the sudden onset soft tissue swelling arising when gas is forced under pressure into the subcutaneous fascia because of myriad causes (pneumothorax, ruptured bronchus, facial bone fracture, paranasal sinus pathology, playing a wind instrument after dental extraction, vigorous nose‑blowing, coughing, or Valsalva maneuver).

We have encountered different degrees of SCE in more than 30 out of over 3000 patients who underwent robotic surgery (hysterectomies and cystoprostatectomies) at our institution. Despite a high incidence rate (2.3% in laparoscopic vaginal hysterectomies, Murdoch et al.), no definite management guidelines exist. The gas used for pneumoperitoneum often dissects into the deeper soft tissues and musculature along the fascial planes. A recent case, where SCE had reached the ipsilateral wrist of the patient starting from the groin (site of surgery), prompted us to develop and present an algorithm [Figure 1] for the management of this condition.

Our patient was a 45‑year‑old, 60 kg male diagnosed with carcinoma penis. He was posted for partial penectomy and bilateral robotic video endoscopic inguinal lymph node dissection. Half an hour after pneumoperitoneum and docking of the “daVinci Xi” surgical robot, the end‑tidal carbon dioxide (EtCO₂) started steeply rising. The tidal volume was increased in increments of 50 ml to 10 ml/kg body weight while the respiratory rate was increased to 18 breaths per minute in an attempt to wash away the excess CO₂ by increasing the minute ventilation. Ventilatory settings were in a volume‑controlled mode with inspiratory–expiratory ratio of 1:2. The EtCO₂ rapidly rose to 67 mmHg. On examination, surgical emphysema was palpable (crepitus) not just over the abdomen, trunk, and neck but also in the axillary region. The pneumoperitoneum pressure was reduced from 15 mmHg to 8 mmHg. When the right radial artery was palpated for obtaining a sample for arterial blood gas analysis, frank crepitus was also observed over the wrist. On applying digital pressure, pitting was observed. The skin could be seen to slowly rise back as it was filled up with gas again. A wide bore needle was used to extract the CO₂ from the infraclavicular region. CO₂ could be seen bubbling through the saline‑filled syringe on aspiration. Finally, the surgery was halted and the patient was placed in Trendelenburg position in an attempt to vent out the CO₂ using the Archimedes’ principle. The arterial blood gas (ABG) (sampled when EtCO₂ was 55 mmHg) showed a partial pressure of CO₂ (PaCO₂) of 68 mmHg. The surgery was resumed once the EtCO₂ dropped to below 45 mmHg as CO₂ got absorbed from the interstitial tissue. A check laryngoscopy and leak‑test were done to make a decision regarding extubation, although crepitus could still be felt in the supramammary area.

Usually, benign and self‑limiting, extensive SCE can cause palpable cutaneous tension, abdominal compartment syndrome, dysphagia, dysphonia, palpebral closure, pacemaker dysfunction, airway compromise, and respiratory failure. [4,5] Our algorithm describes four bundles...