laminectomy syndrome, chronic radiculopathy, intractable neuropathic pain, and visceral pain.[134] While treatment of cancer-related pain is often focused on symptoms explicitly related to the primary malignant diagnosis, true supportive care and palliative care should include all treatments that may improve QOL.[135] Cancer patients remain susceptible to all non-cancer-related pain pathologies. With the increase of MRI compatible technologies, we must ensure that patients are not excluded from evidence-based therapies because of their malignant diagnosis. This includes access to evidence-based use of neuromodulation for non-cancer-related syndromes.[136]

In addition, adverse effects of many cancer treatments are amenable to SCS. With five-year cancer survival rates for all cancer diagnoses increasing from 50.3% to 67% over the past 20 years, more patients are living with the chronic pain resulting from effective cancer treatments.[137] Fifty-two percent of patients exposed to neurotoxic chemotherapeutic agents develop chemotherapy-induced peripheral neuropathy (CIPN) with median time to symptom development of 71 days.[138] Many case reports demonstrate effective treatment of CIPN with SCS, but currently there are no RCTs demonstrating efficacy.[139–141] Early bench research has shown the role of SCS in preventing CIPN. Sivanesan et al demonstrated that SCS may attenuate CIPN pain-related behavior in rats prior to treatment with paclitaxel.[142] While more studies are needed, with few proven effective pharmaceutical treatments and continued improvements in technology, SCS is a viable treatment option for refractory CIPN.

Many patients with abdominal, gynecologic, and orthopedic cancer require surgical treatment which may result in nerve damage and subsequent neuropathic pain, post-surgical pain, or peripheral causalgia. A recent publication by Hagedorn et al reviewed the use of SCS for cancer-related pain, both cancer- and treatment-related pain.[17] In general, the literature regarding SCS for the treatment of cancer-related pain is largely represented by case reports and small case series. In 2010, Yakovlev et al reported on 14 patients with lung cancer who underwent SCS for post-surgical pain. At 12 months post-implant, all patients had greater than 50% VAS pain reduction, and all patients had decreased or discontinued pain medications.[143] In 2012, Yakovlev et al described 15 patients with treatment-related low back pain after undergoing treatments for metastatic colon cancer, anal cancer, or angiosarcoma of the sacrum. At 12 months post-implant, all patients had greater than 50% pain relief and 86% had decreased or discontinued pain medications. In the largest patient cohort to date, Shimoji et al published a retrospective review of 52 patients with carcinoma or sarcoma of the head/face, neck/upper extremities, trunk, or lower extremities. The authors reported that while the subjects obtained 80% pain relief initially, this decreased to 20% pain relief at 1 year.[144]

Extrapolating from non-malignant pain data, both SCS and DRG-S are effective for refractory neuropathic, postsurgical and peripheral causalgia-related pain.[145–148] Also, many patients with primary spinal tumors or metastasis may require laminectomy, decompression, and fusion. Since approximately 30% of the patients develop pain worse than or equal to their pain prior to spine surgery, many of these patients may require treatment for failed back surgery syndrome (FBSS).[149] With high-quality evidence for the treatment of this condition in both post-surgical lumbar and cervical radicular pain, SCS should be considered early in the treatment algorithm for these patients.[150,151]

Device Selection

Cancer patients may require screening MRI for progression of disease or evaluation of new symptoms. With regard to device selection, it is imperative to understand the MRI conditionality of the devices.[130] In the non-cancer population, Desai et al found that 82–84% of SCS-implanted patients were expected to need at least one MRI within 5 years of implant. Within 10 years of implantation, 59–74% of all patients implanted were likely to require non-spine MRI.[152] Additionally, consideration should be given to the degree of patient comfort in maintaining, charging, and programming the implantable pulse generator (IPG).

Evidence Evaluation and Best Practice Statement

- Spinal cord stimulation may be considered in patients with refractory cancer pain. II-3-C
- Spinal cord stimulation may be considered on a case-by-case basis for pain that is related to cancer treatment such as chemotherapy induced peripheral neuropathy. III-C