

Interventional Anesthetic Methods for Pain in Hematology/Oncology Patients



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KEYWORDS

• Anesthetic techniques • Regional • Cancer pain • Intrathecal drug delivery

KEY POINTS

- Approximately 20% of patients with cancer do not receive adequate pain control despite following the WHO pain stepladder; for these patients interventional measures may provide relief.
- There are several single-injection interventions to treat pain that is in an anatomic location clearly supplied by one or more neural pathways, including peripheral or central nerve blocks, plexus injections, and sympathetic nerve neurolysis.
- Continuous infusion therapy through epidural, intrathecal, and perineural infusions can relieve pain with logarithmic medication dose reduction compared with oral route of administration and with significant decreases in side effects.

INTRODUCTION

When cancer pain cannot be adequately treated with traditional medication administration routes, there are numerous interventional procedures that can aid in the management of intractable pain. It has been estimated that cancer pain is well managed for 75% to 90% of patients with cancer by following the World Health Organization (WHO) stepladder for medication escalation.^{1,2} However, for the remaining 10% to 25% of patients who have failed conventional treatment, poor pain control is associated with decreased quality of life for patients and their families.^{3,4} Additionally, some patients experience intolerable systemic side effects from traditional pain management approaches that necessitate consideration of alternative approaches and routes of administration to achieve relief.^{5,6} For these patients, interventional anesthetic procedures are critical in improving daily functioning and quality of life, and reducing medication side effects.

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This article introduces and reviews the wide variety of interventional techniques available in the treatment of simple and complex cancer-related pain. Reviewed are the epidemiology, assessment of pain, specific causes, and progression of pain as they pertain to interventional approaches to cancer-related pain (a discussion of general assessment of the patient in pain is found in Regina M. Fink and Jeannine M. Brants' article, "[Complex Cancer Pain Assessment](#)," in this issue). Also reviewed are the indications for and efficacy of various interventional procedures for targeted pain control in the patient suffering from cancer. The goal is to provide an understanding of when to consider interventional pain management for patients with cancer-related pain and to define the role of the pain physician as part of the oncology team.

EPIDEMIOLOGY OF CANCER PAIN

Estimates of prevalence of cancer pain vary widely because of lack of standardization in definition and reporting variability. The highest rates of pain reported are for head and neck cancer, prostate, uterine, other genitourinary, breast, and pancreatic cancers.^{7,8} The prevalence of pain in patients in active treatment is estimated to be between 24% and 73%.⁹ Those patients with advanced or terminal disease are estimated to have a pain prevalence between 58% and 69%. Surprisingly, patients in remission from their disease report a pain prevalence between 21% and 46%.⁸ Of all patients with cancer pain, more than one-third grade their pain as moderate or severe. Cancer pain is multifactorial in origin and thus there does not exist a one size fits all treatment protocol.^{10,11} Cancer pain negatively affects sleep,¹² social life,¹³ and compromises enjoyment of life.¹⁴

Reviews of the WHO ladder of cancer pain management estimate that this management strategy provides adequate pain relief for 75% to 90% of patients.^{1,15,16} This ladder begins with nonopioid analgesics with gradual escalation to mild opioids with the addition of more potent opioids as the last step. At every level, the option of additional adjuvant medication is present. Although opioid medication is introduced early on the WHO cancer pain relief ladder, globally opioid use and availability vary widely.¹⁷ With opioid availability limited in many parts of the world, consideration of alternate therapies and interventions is crucial. Furthermore, it has been traditionally considered that patients should first be given conventional therapies, reserving interventional cancer pain procedures for patients who do not respond. However, this strategy may lead to delayed referrals and uncontrolled pain. Moreover, patients who are referred late in the course of their disease may not be candidates for interventional procedures because they are too debilitated from the advanced disease and from side effects of treatment. A more inclusive, efficient, and humane approach may be to consider multimodal interventions, including interventional therapies, as part of the same toolbox, all concurrent modalities to be applied throughout the course of the disease process.

GENERAL CONSIDERATIONS FOR INTERVENTIONAL PROCEDURES

The application of regional anesthetic techniques through the use of nerve blocks, neurolysis, or continuous peripheral and neuraxial catheter infusions often provides a high quality of pain control with decreased need for systemic opioids. Patients typically are relieved of one or more components of their pain more profoundly than with opioid therapy alone. The use of interventional procedures in patients suffering from cancer is not without added risks. These patients are by definition immunocompromised and are therefore at a higher baseline risk to acquire infection. Additionally, the hypercoagulable state of many cancer states necessitates anticoagulation therapy

for either prophylaxis or treatment of thromboembolic disease. For many interventional procedures, these medications need to be withheld during the perioperative period, thereby exposing the patient to potential thrombosis. The procedures themselves may be uncomfortable, distressing, and have the potential for minor and significant complications. The decision to proceed must be made after a careful risk and benefit assessment by the care team and patient.

The incidence, severity, and type of pain syndrome vary by location and type of cancer (see Russell K. Portenoy and Ebtessam Ahmeds' article, "[Cancer Pain Syndromes](#)," in this issue). The feasibility of an intervention also depends on the region of the body affected. Finally, the rate of progress of disease influences choice and timing of procedures. Hence, with lung cancer, where pain is a major symptom, and 5-year survival postdiagnosis is low, there may be an accelerated urgency to offer advanced procedures earlier than, for example, a patient with breast cancer, where even with lung or bone metastases median survival is 18 to 29 months and a more, stepwise approach might be permitted.^{18,19} This is by no means a rule, because the course of either disease could be indolent or rapidly progressive or markedly improved by targeted therapies or immunotherapies.

The most common pain conditions that are amenable to anesthetic interventions are related to the abdomen and pelvis, with solid organ tumors of the pancreas, kidney, ovarian, and cervical cancer. Infusion therapy through indwelling catheters in the periphery and neuraxis is feasible for pain of the torso and extremities, and depending on the skill and comfort level of the practitioner, less so for cancers of the head and neck.

Characteristics of Cancer Pain

The dominant characteristic of cancer-related pain is that it can (and usually does) change over time. It is also often a mixed pattern, with components of acute and chronic pain, and nociceptive and neuropathic in nature. Additionally, pain may arise from several origins, involve multiple sites, and different processes may affect the patient at the same time, and some of these may arise outside the area covered by an intervention. Patients therefore often need to receive multiple modalities. For example, even in a patient with an intrathecal pump for severe pelvic pain, draining ascetic fluid, bracing a foot drop, or irradiating a clavicular metastasis can all contribute to the overall comfort of the patient, as would a sleep aid and increased pain medication at night if pain is worse at that time. As with any other modality, an increase in pain may indicate cancer progression and should prompt investigation.

Interventional Considerations in Patient Assessment and Diagnosis

Each patient requires a thorough evaluation and timeline of previous symptoms and treatment. A list of all the pains and related symptoms, such as constipation, sedation/insomnia, and mood, should be made. It is important to determine exactly how patients are taking their pain medication and what is its effect. Often asking the patient to describe a typical day and the exacerbating and relieving factors in detail is useful. The examination must be gentle, but complete. Previous scars, any deformities or areas of skin breakdown, and obvious items, such as a colostomy or a G tube, must be noted. Images from recent scans should be examined with special regard to the area of pain, and laboratory results should be checked, especially platelet counts, coagulation assays, and liver function tests. The purpose of the assessment is to postulate the anatomic structures affected (soft tissue, nerve, bone, hollow viscus, or solid organ) and create a mental picture of the pain as it projects on the patient's body. One should prioritize the more severe and/or the most bothersome pains for intervention.

Unique Considerations

Patients who have cancer-related pain present with a unique set of considerations when compared with those who have chronic noncancer pain. The cancer pain specialist must work closely with the oncologist and the palliative care teams and obtain their cooperation and collaboration at all times. An assessment of prognosis is necessary, as is classifying whether the patient is in active treatment or in a purely palliative and supportive mode. It is prudent to ask the oncologist in writing if the patient has days to weeks, or weeks to months, or months to years to live. This helps choose the appropriate interventions.

Additional questions about the effects of chemotherapy on healing or cytopenia are important. If the absolute neutrophil count is less than 1000, most interventions are contraindicated. The timing of the chemotherapy and the nadir of the cytopenic effect may dictate scheduling the intervention at a specific time point. If patients are participants in clinical trials certain interventions might be precluded. If a continuous intervention, such as an intrathecal pump, is planned chemotherapy may have to be suspended temporarily until incisions heal. It is important to obtain the consent of the patient and the assent of the oncologist before proceeding.

Cancer affects the patient's metabolism in variable and unpredictable ways; hence, caution in following guidelines for drug pharmacokinetics is needed, especially if there is hepatic dysfunction. Usual wait times for stopping and starting anticoagulation are sometimes much longer. Constitutional factors influence the procedures in various ways; patients might need sedation for procedures that in the chronic noncancer pain population are done with only local anesthesia. This is because they may be opioid tolerant and suffering from severe acute-on-chronic nociceptive pain and unable to assume the position required for the injection. The physiologic trespass of a minor operation in this population may have prolonged recovery time, and could require a longer inpatient hospitalization. Even the presence of infection sometimes becomes only a relative contraindication, because some patients have conditions that may never heal or are related to their tumor. The risk of patients having infection during operations is considered higher than the noncancer population and aggressive antibiotics is advised periprocedurally. This is because the consequences of an infected implant are more problematic in the patient who already has unmanageable pain, a limited life span, and requires further chemotherapy.

When to Refer

For patients with chronic noncancer pain, pain providers have the option of exhausting conservative measures before pursuing interventional techniques. However, when it comes to patients with cancer pain, the luxury of time is not always available. Because every patient has a different progression and presentation of pain, there is not always a singular "action moment" for referral for interventional pain procedures. We propose the time points listed next as action moments for consideration of interventional pain procedures for the patient with cancer pain:

- Pain that is distributed in a regional or localized body area
- Pain that is distributed along a known nerve distribution
- When pain control requires rapid escalation in opioid doses
- Patients with daily opioid requirements more than 300 morphine equivalents
- When pain is progressing rapidly in the face of poor prognosis
- When the thought occurs to a member of the oncologic care team

Even if pain seems controlled an early referral is wise in patients where an intervention is anticipated to begin a relationship with the interventional pain physician. There is a school of thought that believes in prophylactic placement of an intrathecal device before initiating chemotherapy with the belief that cancer treatment may continue longer if pain is controlled.

TYPES OF INTERVENTIONS

It is convenient to consider interventional pain management to be of two main types (with overlap). There are single interventions that provide benefit at one treatment session (nerve blocks, neurolytic procedures, or cordotomy), and those that need a more continuous or ongoing treatment (usually infusion therapy) requiring an external or internalized pump.²⁰ Sometimes in the cancer-related pain population, combinations of single procedures and/or continuous infusions are pursued. For example, a patient may get a nerve block and a trial or placement of an indwelling device at the same time; or multiple blocks may be done at one time.

SINGLE INTERVENTIONS

A single injection or series of injections of local anesthetic with or without corticosteroids is helpful for diagnosing and treating cancer-related pain. Often the duration of pain relief extends beyond the expected duration (from pharmacokinetic data) of the local anesthetic blockade, especially when an adjuvant, such as a corticosteroid, has also been injected.²⁰

The use of regional anesthetic procedures can lead to increased comfort despite dose reduction of oral and intravenous medication, therefore reducing side effects, such as impaired cognition, fatigue, respiratory compromise, and constipation. Alternatively, the injections may allow for increased medication efficacy of a systemic opioid dose that was previously ineffective and thereby facilitate outpatient pain control.

Single injections are as simple as trigger point injections for myofascial pain related to cutaneous or bony metastases, the more complex temporary nerve blocks, or the even more complicated and longer-lasting neurolytic procedures. Limited only by operator skill and imaging modality availability, a wide array of cranial or spinal nerves and peripheral nerves or neural plexuses can be “blocked.” Blocks can typically be performed in awake or sedated patients using surface anatomy, ultrasound guidance, and fluoroscopic or tomographic imaging, to anesthetize a nerve plexus or specific peripheral nerve. Virtually any nerve can be “blocked” with a combination of local anesthetic and corticosteroid with the expectation of relief on the order of weeks. Although nerve blocks with local anesthetic with or without adjuvant medications are a well-described and frequent tool in the anesthesiologist’s armamentarium, standardization of practice and clearly defined therapeutic mechanism for the duration of action and degree of pain control are not well established.^{21,22} The expectation is for the pain relief to last from 2 to 6 weeks similar to injections for chronic pain and injections can be repeated, eventually with diminishing results.^{23,24}

Mixed spinal or cranial nerves and autonomic plexuses can also be targeted for a similar temporary nerve block, and, if that is effective, for neurolysis, which may offer relief for some months. Neurolysis involves a physical (thermal radiofrequency lesioning [RFL] or cryoablation) or chemical (alcohol or phenol) treatment to a peripheral nerve to temporarily inhibit transmission of signals to the central nervous system and prolong the duration of pain relief for a few months. For bony metastases, intralesional injections with corticosteroids^{25,26} are helpful, whereas kyphoplasty or

vertebroplasty procedures can be performed for patients with intractable bone pain from vertebral fractures. Kyphoplasty and vertebroplasty are discussed in Nicholas Figura and colleagues' article, "[Mechanisms of and Adjuvants for Bone Pain](#)," in this issue.

Peripheral Nerve Blocks

When a patient has pain along the territory of a peripheral nerve or plexus, a peripheral nerve block is used to anesthetize along its distribution to provide short term relief. The nerves of interest are located using surface anatomy projection or under ultrasound visualization with care to identify surrounding vascular structures. A needle is advanced to the neural sheath and local anesthetic is injected in a targeted manner with subsequent analgesia in the distribution of the neurosensory pathway. Numerous adjuvant medications can be injected including epinephrine, corticosteroids, opioids, and α_2 -agonists to enhance and prolong the block.²⁵⁻²⁷

Peripheral nerve blocks are used as a diagnostic tool to determine a source of pain or for perioperative anesthesia, such as before tumor biopsy or fracture fixation. Nearly every region of the upper and lower extremities and most areas of the head, neck and trunk can be anesthetized by peripheral nerve blocks.²⁸⁻³⁰ Blockade of the thorax, abdomen, and trunk is also possible through peripheral blocks, although for neoplastic radiculopathy in the extremities, more commonly neuraxial injections in the epidural space are used.³¹

When longer term relief is desired, a catheter is placed in the region with a continuous infusion of local anesthetic and other adjuvants. These catheters are tunneled or port-a-cath placement is pursued along the nerve trajectory to allow long-term infusion and decrease the risk of infection associated with nontunneled devices. The contraindications to nerve blocks include patient refusal, true allergy to local anesthetic, significant coagulopathy, or systemic or overlying infection. In patients with end-stage disease, a risk-benefit assessment may be performed by the clinicians, patient, and family regarding risk of significant bleeding and infection spread versus establishing comfort at the end of life. Technically, these blocks and catheters may be difficult to perform because of distorted anatomy from surgery, radiation, or effects of tumor or edema.³² In the hands of an experienced practitioner, complications are generally rare and minor. They include block failure, catheter misplacement or migration, neural injury, and damage to surrounding structures.³³⁻³⁵ Individual blocks have specific risks associated with their anatomic location. Overall, complication rates drop when ultrasound guidance is used to perform the injection.³⁶

Neurolysis with Chemical or Physical Agents

Autonomic plexus neurolysis procedures have been shown to provide significant pain relief that can last on the order of months. These blocks can target visceral pain in the head, trunk, abdomen, pelvis, and extremities. **Table 1** lists common sympathetic plexus blocks and their indications. The injections are typically performed under fluoroscopic, computed tomography, or ultrasound guidance. Typically, chemical neurolysis is performed using high-concentration alcohol (97.5%) or 6% phenol.

Neurolytic injections for cancer pain result in improvement in pain score, decreased opioid intake, and decreased side effects related to opioid intake.³⁷ Management of visceral abdominal pain, such as from metastatic pancreatic cancer, with celiac plexus neurolysis has been shown in a meta-analysis to have 90% pain relief for at least 3 months following the intervention.^{37,38} Superior hypogastric plexus neurolysis is performed for visceral pain related to pelvic cancers (including gynecologic, genitourinary, and colorectal disease). Studies suggest between a 53% and 72% success

Neurolytic Block	Indication	Anatomic Location	Complications
Stellate ganglion block	Upper extremity and facial pain	Anterior to transverse process of C7	Vascular injury Pneumothorax Brachial plexus and vagus nerve injury Hematoma
Celiac plexus block	Visceral abdominal pain including pain from pancreatic, gastric, biliary, and esophageal malignancies	Anterior to the L1 vertebral body	Orthostatic hypotension Diarrhea Hemorrhage (rare) Paraplegia (rare)
Lumbar sympathetic block	Sympathetically mediated pain of the lower extremities	Anterior to the L3 vertebral body	Intravascular injection Vascular injury Renal or ureteral injury
Superior hypogastric plexus block	Visceral pelvic pain	Anterior to the L5 vertebral body	Intravascular injection Vascular injury
Ganglion impar block	Rectal and coccygeal pain	Anterior to the sacrococcygeal junction	Rectal perforation Fistula formation

rate (>50% improvement of visual analogue scale [VAS] for at least 1 month) of this injection in patients with cancer-related pelvic pain.^{37,38} Ganglion impar neurolysis is especially effective for lower pelvic visceral pain and the procedure itself is fairly low risk.^{39,40} This is often combined with bilateral S3 nerve root block to target additional somatic components of pelvic pain associated with cancer.^{41–43} A small study of 15 patients with cancer-related pelvic pain demonstrated at least a short-term benefit (decreased pain score and decrease morphine consumption) of pelvic pain following combination ganglion impar injection and superior hypogastric plexus injection.⁴⁴ Historically, intrathecal phenol was used widely to treat cancer-related pelvic pain. However, with the advent of effective neuraxial infusions, and the necessity for the phenol to be compounded often at an extramural pharmacy, phenol injection has become less common. Nevertheless, it is useful in the patient too ill for other procedures, especially when patients may have already compromised bowel and bladder function.³⁹

Peripheral neurotomy through RFL is also a well-described practice for chronic, noncancer pain.⁴⁵ RFL has been used to target and kill metastatic cells in a manner similar to RFL for neuroablation.⁴⁶ This technique involves directing alternating current at a high frequency through a needle to heat surrounding tissue. This creates scar and cell necrosis, which when involving affected nerves can provide significant relief. Intralesional RFL has also been described for bony metastases⁴⁷ and soft tissue lesions.⁴⁸ One major benefit of all of these procedures is their relative degree of minimal invasiveness and the ability to repeat the procedures should pain progress or return. A similar process with the use of extreme cold, cryoanalgesia and cryosurgery, also has application. This procedure uses a freezing and thawing technique to induce cellular apoptosis and regional ischemia to cause cellular death of desired tumor lesions by forming an “iceball.”^{49,50} It is performed as part of cancer treatment or for symptom management alone.^{49,51}

Neurosurgical Intervention and Spinal Cord Stimulation

A brief mention of neurosurgical interventions for intractable cancer pain is warranted, although the details are outside the scope of this review. Surgical cordotomy is a procedure that involves severing of the spinothalamic tracts to arrest pain signal transmission to the thalamus.^{46,52–54} Surgical destruction of the ventrolateral portion of the dorsal rootlet entry zone, known as DREZotomy, has also been reported to improve neuropathic pain in a variety of conditions including cancer pain.⁵⁵ Dorsal root ganglion stimulation and spinal cord stimulation through implantable stimulators is a growing treatment of complex regional pain syndrome and other neuropathic pain syndromes.⁵⁶ These technologies have not been well studied in cancer-related pain and pose some potential areas of challenge with regards to the patient with cancer. Typically for non-cancer pain, these devices necessitate a stable pain syndrome (not one that is expected to progress significantly over time), which is unusual in cancer. Moreover, previous technology was not MRI-compatible, which limited its use in the patient with cancer who might need frequent imaging. However, with the availability of MRI-compatible electrodes and battery packs these devices present an avenue for future application.⁵⁷

CONTINUOUS NEURAXIAL INTERVENTIONS

Neuraxial medication delivery through epidural and intrathecal catheters is a growing field in the management of cancer and chronic noncancer pain. This therapy takes advantage of the logarithmic dose reduction of opioid analgesics in the cerebrospinal fluid compared with oral and intravenous doses required to achieve equivalent analgesia. This dose reduction leads to a decrease in unpalatable side effects including cognitive slowing, gastrointestinal upset, constipation, and respiratory depression; however, pruritus and peripheral edema are more common with intrathecal administration. Patients who have (or are expected to develop) escalating opioid requirements, difficult-to-control pain, or intolerance to medication regimen should be considered for continuous neuraxial therapy.⁵⁸ Typically, patients undergo a trial of epidural or intrathecal therapy before proceeding with a semipermanent or permanent implant. A trial requires first establishing clear goals of care and expectations with the patient, their family, and care team. The primary purpose of pursuing continuous neuraxial infusion is to decrease pain with secondary benefits of improving quality of life, allowing tolerance of treatment and rehabilitation programs. Formal psychological assessment before a trial (a standard of care for intrathecal modalities for nonmalignant pain), maybe considered but is not essential in many cases. However, patients who are unable to report symptoms reliably, or who have difficulty complying with follow up visits, may not be suitable candidates for continuous interventions.

Once the patient and care team have decided to proceed, a trial of epidural or intrathecal medication is given through a percutaneously placed catheter or a single injection.⁵⁹ Adherence to the American Society of Regional Anesthesia and Pain Medicine guidelines with regards to anticoagulation is essential to prevent the devastating consequence of epidural hematoma formation with subsequent spinal cord compression.⁶⁰ Additional considerations include anatomic evaluation of the spine to ensure there is no involvement of the epidural space, dura, or thecal sac especially at or near the thoracolumbar spine, although this is a relative contraindication.

Occasionally, in the patient who finds positioning for radiation therapy or lying still for any length of time impossible because of intolerable pain, epidural analgesia is immensely beneficial; the insertion of an epidural catheter for the duration of treatment, typically 7 to 10 days, and infusing analgesic solution during the periods of therapy can safely accomplish the desired goals, albeit at the expense of a longer inpatient stay.

A trial may last anywhere from 1 to 7 days. During this time, frequent assessment of pain control, along with vital signs and neurologic examination, is necessary. For this reason, trial periods nearly always occur in the inpatient setting. The goal of a trial is to establish efficacy and additionally conduct a dose-ranging study of medications at which a noticeable improvement in symptoms occurs. There are currently three medications that are approved by the Food and Drug Administration for the intrathecal route: (1) morphine, (2) ziconotide, and (3) baclofen. However, there are a plethora of other medications that are now widely used via intrathecal delivery in routine clinical practice. Commonly used neuraxial medications include opioids (morphine, hydromorphone, fentanyl, sufentanil), local anesthetics (bupivacaine), and adjuvant medications (clonidine). Occasionally, the trial period is bypassed in the patient with cancer with end-stage disease, severe immunodepression, or concern that trial will significantly prolong the patient's suffering.⁵⁹

A trial is typically considered successful if a VAS reduction by 50% is obtained. Clinical practice varies widely, however, and ultimately the definition of a successful trial must be tailored to each patient.⁵⁰ Once a patient has been deemed a candidate for continuous neuraxial infusion, there are several options for medication delivery. Depending on prognosis and anatomy, the patient may have an external system (either tunneled or via a port-a-cath) or an implantable system placed to aid in long-term pain control. Placement of an implanted drug delivery system is minor surgery. In a fragile and complicated patient with limited reserve, and an unknown velocity of tumor progression, it still cannot be undertaken lightly.

Frail patients and patients with a predicted life expectancy less than 3 months are often better candidates for externalized epidural infusion systems. Because of the open connection with the skin, externalized systems are at increased risk of infection compared with indwelling devices. Tunneling the catheter under the skin can reduce the risk of infection and prevent catheter migration.⁵⁹

Before placement of an internal or external infusion device, it is critical to determine insurance coverage for home care of external infusion devices, and to coordinate with hospital and/or hospice staff and the patients' informal caregivers regarding their ability to manage postprocedure wound care and the infusion. It is common for dosing and medication regimens to change over time and thus close follow-up of these patients by the pain service is crucial to ensure that the patient's symptoms are optimally controlled. If patients experience waxing and waning pain symptoms, the ability to add a patient-controlled bolus dose allows for rapid treatment of pain without increasing the basal infusion. This is incorporated easily into a patient-controlled epidural pump using a button similar to a Patient Controlled Analgesia. For surgically implanted intrathecal pumps, an external remote control communicates wirelessly with the pump to deliver an on-demand dose for patient-controlled intrathecal analgesia.⁶¹

CHOICE OF INTERVENTION

When the pain syndrome is easily identified, the appropriate single intervention (eg, a celiac plexus block) is offered in a straightforward manner. More commonly, if the patient's pain is complex and multifactorial, more than one procedure may be needed to treat the spectrum of the patient's symptoms. If a patient's pain spans more than four to six dermatomal levels, it is unlikely to completely respond to injections and an epidural or intrathecal infusion should be offered. Often after the dominant pain has been successfully treated, other subsidiary pains emerge and acquire importance and urgency. Infusions, nerve blocks, and neurolysis can reduce the need for systemic

opioids but not eliminate them. Systemic opioids and adjuvants are often still needed, albeit usually at lower doses.

An estimate of prognosis is a vital consideration; when it is clear a patient will live months to years a completely implantable pump is appropriate. If it seems a patient is days or weeks away from the end of life, an external infusion is probably the path to be adopted. It is when the patient is likely to live weeks to months that the decision is more nuanced. Secondary factors, such as psychosocial situation, home environment, distance from the hospital, language or communication barriers, insurance coverage, and the availability of domiciliary services, all need to be considered as part of the final decision.

SUMMARY

Within the interdisciplinary cancer care team, the interventional pain physician is often the last resort to manage patients with cancer pain syndromes that have failed to respond to oral medication. By involving a pain care physician early in the process patients may receive superior quality pain relief before side effects from progressively increasing doses of opioids cause general malaise, fatigue, constipation, and cognitive decline. This may permit tolerating chemotherapy for longer periods and eventually increase survival times. A continual reassessment of a patient's pain location, quality, nature, and evolution is imperative to proactively address the changing nature of cancer pain that a patient is likely to experience. An attempt should be made to stay "a step ahead" of a patient's pain and predict what pain problems may occur next. Adopting an aggressive pain management strategy can help patients with devastating disease states live the best possible quality of life during the course of the disease. Although the complete eradication of cancer pain is a lofty goal that may not be possible with every patient, certainly it is an aspiration all team members can support. Finally, caregiver stress in pain management professionals who are unused to end-of-life situations demands co-training in palliative care to avoid compassion fatigue and physician burnout.

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