

## Case Report

# A CASE OF INTRATHECAL PUMP THERAPY FOR INTRACTABLE HEAD AND NECK CANCER PAIN

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We present a case of a 34-year-old man who had refractory oral pain secondary to squamous cell carcinoma of the tongue and describe his status post multiple surgical procedures. After failing a variety of treatment modalities, an intrathecal pump (ITP) was placed in the lower cervical spine region. He was assessed at several points, initially every 2 weeks, then every 6 months and reported significant and continued pain relief with the ITP past the first 6-month follow-up and no

neurological or respiratory side effects were noted. In addition to substantial pain relief, this invasive modality allowed the patient to be a candidate for further chemotherapeutic medications, which induced temporary remission and extended the patient's life expectancy by over 4 months.

Key words: Intrathecal pump, intractable pain, head and neck cancer

Head and neck cancers (HNC) account for 3% of cancers in the United States, with approximately 62,000 cases each year. In HNC, 78% of patients report pain in the head, face, or mouth and 54% in the cervical region or shoulder. Pain due to oral mucositis is the most frequently reported patient-related complaint impacting quality of life during cancer therapy (1). HNC pain, and specifically oral pain, may be particularly challenging to block due to the rich innervation of the orofacial region and aggravation by motor functions, which act as constant pain stimuli (2).

In patients with intractable pain despite conservative/surgical measures, interventional procedures may be considered. Intrathecal pump (ITP) therapy is an option for patients with a life expectancy of more than 3 months while still being considered at the terminal

stages of the disease. ITP therapy has been shown to be exceedingly effective in patients with intractable HNC pain (3). Many of these patients are palliative patients with terminal illnesses who would be willing to attempt more radical options to improve their quality of life (4).

Disclosure: The patient's family provided written consent to publish this case report.

## CASE PRESENTATION

A 34-year-old previously healthy man developed oral pain in July 2014 and was eventually diagnosed with squamous cell carcinoma (SCC) of the tongue. Over the next 15 months, he underwent partial glossectomy, neck dissection, 2 rounds of chemoradiotherapy, completion of total glossectomy, partial mandibulectomy, tracheostomy, and percutaneous endoscopic gastrostomy tube (PEG) placement. The patient continued to have recurrent metastatic lesions, and further surgical interventions were deemed ineffective and of high risk.

The patient was referred to pain management for treatment of his intractable pain. His pain regimen

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consisted of a fentanyl patch that released 200 mcg per hour every 48 hours and 80 mg of liquid morphine every 4 hours via PEG. He had been tried on several antineuropathic pain medications with no improvement. He reported severe pain in the mornings despite waking up to take a dose of morphine at 2 am. The patient also suffered from severe depression and anxiety due to his disease progression, requiring treatment with benzodiazepines thus increasing his risk for respiratory depression and accidental overdose.

After discussing the benefits and risks of an ITP, the patient elected to proceed with ITP therapy. A screening trial before pump implantation was performed. An intrathecal (IT) morphine infusion was started through a temporary percutaneous IT catheter at 75 mcg per hour with a dose of 1.8 mg per day. On this regimen, verbal pain scores were rated at 1 on a 10-point numerical pain scale. A programmable Medtronic SynchroMed II system (Medtronic Inc., Minneapolis, MN) was implanted with Patient Therapy Management (PTM). The catheter was introduced through the L1-2 interspace, and the catheter tip was advanced until it reached the C6 level.

The patient reported minimal pain on postoperative day 1 and was discharged home. Two weeks later, PTM was started (an additional 20 mcg of morphine bolus over 10 minutes, with a maximum of 5 doses per day) to assist with occasional breakthrough pain. During the follow-up period over the 6 months post implantation, the patient reported satisfactory pain control with no need for any opioid supplementation. No neurologic/respiratory complications or signs of infection were noted on follow-up visits.

## **DISCUSSION**

In patients with HNC, pain is reported in up to 85% of cases at diagnosis (2), and it is estimated that 45% to 80% of all cancer patients have inadequate pain management (5). Possible explanations for this inadequacy include patients' reluctance to report pain, current pain management practices by physicians, and providers' negative ideas about and regulatory barriers to the use of opioids (6). In addition, limited understanding of the frequency and role of neuropathic pain mechanisms and the lack of use of

multimodal management approaches for neuropathic pain may compromise management of this pain in cancer patients. Neurostimulation is an effective treatment modality for neuropathic pain and has been used successfully for trigeminal neuropathic pain by direct stimulation at the Gasserian ganglion. However, technical challenges and tolerance to stimulation are often reasons for failure of neurostimulation to provide long-term relief. ITP therapy can target this area more directly and consistently, providing increased success in terms of significant long-term pain relief (7,8).

The advantage of IT opioid administration is seen in the much lower dose needed to treat the HNC pain, as it works directly on the opioid receptors in the spinal cord affecting pain transmission at multiple levels (7,9). Despite these advantages, a PubMed search yielded relatively few other case reports employing IT pumps for treatment of HNC pain, but 2 reports published in the 1990s demonstrated significant benefit for patients with HNC (10,11).

In this case, our patient was tried on large doses of opioids and other adjuvant medications with no benefit. He experienced significant and constant pain, which led to an inability to participate in treatment. His life expectancy was predicated to be around 4 months given that his cancer was no longer responsive to chemotherapy. He was approached with his parents regarding an IT trial with a temporary IT catheter. The patient was initially reluctant, given the extent of procedures he has endured, and was contemplating hospice. However, he wanted to avoid being oversedated, which was not possible with the doses of opioids he was currently receiving. After placement of a temporary IT catheter with a catheter tip at C7 and morphine IT infusion at 75 mcg per hour. Our patient was requiring a fentanyl patch of 200 mcg per hour every 24 hours and 80 mg of morphine per PEG tube every 4 hours, with one extra dose given if his pain was still not controlled.

This dose was converted to oral morphine, which was 480 mg of oral morphine per day to account for the fentanyl patch and 540 mg per day to account for the morphine given by PEG.

The trialing dose of morphine was chosen based on calculating the patient's total dose of daily opioids,

which was around 1 gm of oral morphine per day when accounting for all of the breakthrough opioid doses. The morphine dose was cut by 50 percent to account for the change in route. The dose was further divided by 300 to convert to IT morphine. The final IT dose was 1.8 mg of morphine per day. The dose was divided by 24 hours, resulting in our final dose of 75 mcg of IT morphine per hour. Our patient experienced complete relief of pain within 24 hours and required no other oral opioids. A programmable Medtronic SynchroMed II system (Medtronic Inc., Minneapolis, MN) was implanted with Patient Therapy Management (PTM). Our patient was able to participate in further chemotherapy trials and received a newer chemotherapeutic agent that was successful in shrinking his tumor and increased his life expectancy from 4 months to 8 months. He experienced no complications from the pump therapy and was able to perform all of his activities of daily living until he expired from the tumor eroding into the common carotid.

There are multiple reasons to explain the lack of prevalent cervical ITP therapy for intractable HNC pain despite potentially significant results. First, patient selection is a priority and can be difficult to assess. Patients should have a prognosis of greater than 3 months with a level of activity worth maintaining with aggressive treatment. The patient should be trialed on available conservative measures first and must have the ability or support to maintain the catheter/pump system and be dependable for follow-up. Patient communication regarding the benefits and risks of this procedure must be made clear before a trial is initiated.

Following patient selection, concern for risks of placement, especially at this high spinal level, deters many providers from considering ITPs for HNC pain. Applegren et al placed 13 intracisternal ITPs from 1990 to 1995 using 3 different techniques, with none resulting in prolonged neurological complications (3). Hayek et al (one patient case report) and Crul et al (2 patients) also had no lasting complications from catheter or pump placement (7,11). Although there is obviously risk due to the sensitivity of the surrounding structures, providers proficient in ITP placement can safely navigate the catheter to these higher spinal levels under fluoroscopy guidance. Patient-specific

risk factors, such as anticoagulation status (cancer-induced thrombocytopenia or hypercoagulable state requiring anticoagulation therapy), anatomical variations, or baseline respiratory concerns might contraindicate such catheter placement (3,10,11).

All sensory or motor side effects from the implanted cervical ITPs discussed above resolved with a decrease in the dosing, usually of the local anesthetic. Bupivacaine was used most commonly, and since it preferentially blocks neuronal sodium channels on smaller axons (A-delta and C fibers) as the nerve root approaches the cord in the intrathecal space, the analgesic effect is almost instantaneous (12). For patients with longer life expectancy or non-cancer head and neck pain, a local anesthetic addition to the infusion pump has the added benefit of exposing the patient to fewer opiates and limiting tolerance (7). Our patient had a short life expectancy, so comfort was our main priority over limiting opiates. Fentanyl, morphine, and hydromorphone have all been used in ITPs and we chose morphine for our patient. Morphine is one of the few FDA-approved drugs for ITP use; thus, we aired on the side of caution by using an FDA-approved drug that was readily available in our pharmacy. With this case, we were able to demonstrate how, by implanting a cervical catheter, morphine can be safely utilized, as the doses needed to control pain are lower than a traditionally thoracic or lumbar implanted catheter.

We began with an opiate-only infusion for simplicity and had successful results without any neurologic or respiratory side effects; adding a local anesthetic to our infusion proved unnecessary. Our patient had a large fungating necrotic disfiguring tumor (as seen in included Fig. 1) with missing lower jaw and hardware exposed, which rendered the patient high risk for infection. Our case report emphasizes the importance of balancing the risk and benefit, with the benefit outweighing the risk in this case. Our patient had no other options but hospice with high doses of opioids leading to altered mental status and death.

Our case highlights how ITP in a high-risk patient led to a doubling of his life expectancy from 4 to 8 months; this was also shown in prior studies by Smith et al in 2002 and 2005 (13,14). Despite this evidence, patients with advanced HNC are not considered for



Fig. 1. Contrast medium-enhanced computed tomography (CT) scan showing a large tongue mass. The arrowhead points to the posterior border of the mass. The arrow points to jaw bone destruction by the tumor.

ITP due to the reasons addressed in our case report. The limitation to our case was that our patient was a young, otherwise healthy man; these conditions may not apply to other cases of HNC in which other comorbidities commonly exist. Future cases of HNC refractory pain patients should be considered for ITP when morphine should not be excluded.

## CONCLUSION

A morphine ITP with the catheter tip at the cervical level serves as an effective palliative modality for intractable HNC pain. Neuraxial analgesia provides highly selective pain relief with a lower total dose of opioid administered, minimizing side effects. Risks for



Fig. 2. Cervical and thoracic magnetic resonance imaging (MRI) without contrast medium. The arrowhead points to the large tongue mass.

serious complications can be minimized with careful patient selection, appropriate postoperative patient monitoring, and gradual titration of the IT infusions. This case demonstrates the effectiveness of ITP therapy for patients with intractable HNC pain and should be considered as a viable option for similar patients who have failed other modalities.

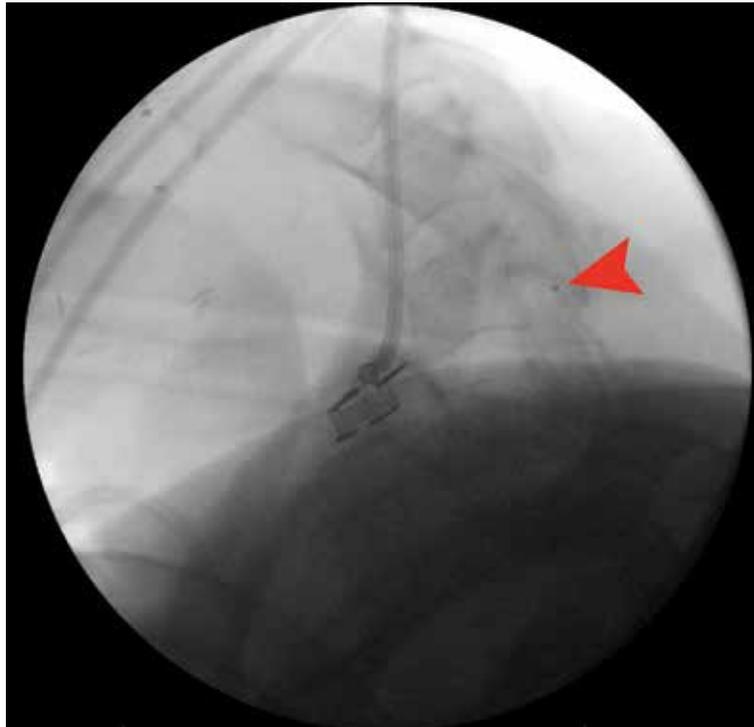


Fig. 3. Intraoperative fluoroscopic view of the final revised position of the intrathecal catheter. The arrowhead indicates the catheter tip in the intrathecal space at the level of C7.

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