

Intrathecal Morphine Pump in Cancer Pain Management

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Editorial

What is Intrathecal Morphine Pump?

Intrathecal morphine pump is a medical device used to deliver morphine directly into the cerebrospinal fluid for pain management. It is primarily used for patients with severe pain, particularly due to cancer or chronic pain conditions, who do not respond adequately to oral or systemic opioids. It is a programmable device placed under the skin, usually in the abdomen. A thin catheter connects the pump to the intrathecal space around the spinal cord allowing the morphine to be delivered directly [1].

Mechanism of Action

Opioids work in the three areas of central nervous system: the periaqueductal -periventricular gray matter, ventromedial medulla and spinal cord. Morphine interacts with the mu receptor sites of the brain with higher concentration seen in posterior amygdala, hypothalamus, thalamus, caudate nucleus, putamina region, cortex and also in the terminal axons of primary afferents in the substantia gelatinosa of the spinal cord.

Pharmacodynamic of Intrathecal Morphine

The onset of action - 5 to 10 minutes, duration of action as long as 20 hours, distribution is 1.0 to 4.7L/kg after intravenous dosing and there is only limited data suggesting volume of distribution of morphine in the intrathecal space

is 22+/-8ml.

Dose of Intrathecal Morphine Pump

Dose administered through the morphine pump varies based on patient age, weight, overall health status, opioid tolerant or opioid naïve patient, previous history of side effects and physician variance. Initial dosing of intrathecal pump is 1 to 5mg per day depending on pain intensity and opioid naïve/ opioid tolerant patient. Doses can be adjusted based on patient needs and gradually increased to achieve optimal pain control. Maintenance dose can range from 5 to 15mg per day, few patients may require higher doses especially if they are opioid tolerant. Intrathecal pump can have dual delivery mechanism like continuous and intermittent depending on the machine instructions, physician recommendations and individualized patient needs [2].

Patient selection for an Intrathecal Morphine Pump

Process of selecting patients for Intrathecal Morphine pump involves:

- **Characteristic of Pain:** Pain should be severe in intensity and chronic pain that is not adequately controlled by oral or systemic opioid medications
- **Type of Pain:** It is indicated in Nociceptive pain like cancer related pain or refractory neuropathic pain
- **Treatment Response:** Patient with poor tolerance to opioids or severe side-effects after starting opioids. A trial of intrathecal morphine injection can be done to assess pain relief and tolerability before implanting a permanent pump
- **Past Medical History:** Psycho-Oncology referral to

evaluate the psychiatric disorders, mental health conditions, substance use disorders and patient fitness for compliance to treatment and managing chronic pain should be sorted. All the neurological issues and overall health should be evaluated prior to the decision of Intrathecal Morphine pump installment in cancer patients.

- **Anatomy of Spine:** MRI is the investigation of choice to assess the spinal anatomy and to assure that there is no anatomical distortion that would interfere with the catheter placement.
- Informed consent to be taken prior to the procedure, all the benefits and risk of procedure and complication to be taken, there should be compliance to treatment and further follow up in clinic [3].

Benefits of Intrathecal Morphine Pump

Adequate Pain Control: Morphine can be directly administered into the cerebrospinal fluid with the help of the implanted catheter device for adequate pain control.

Dose requirements: Patients need much lower doses of Intrathecal Morphine than oral or IV Morphine significantly reducing the systemic side effects of opioids, also the Intrathecal dosages can be easily adjusted by physicians based on the patient requirements and need over time.

Better Quality of life: Patients have reported significant improvement in the overall wellbeing and adequate pain control with intrathecal morphine as the pump is continuous and programmable and gives them long standing pain relief throughout the day without interfering their activities of daily living

Tolerance and Compliance: Direct delivery of opioids has reduced the risk of tolerance to opioids. Patients have reported better satisfaction, compliance and adherence to intrathecal morphine pump as it can last several weeks or months before needing a refill reducing the need for daily medication intake.

Combination Therapy: Intrathecal pump can be used to mix adjuvants like local anesthetic along with morphine allowing combination therapy in pain management.

Procedure for Implantable Morphine Pump Installation

Pre-Procedure: After detailed medical history, physical examination and imaging like MRI Spine or CT Spine, an informed consent to be taken about the procedure, potential complications and risks to be explained in detail. The procedure is done under local anesthesia with sedation but few patients might require general anesthesia as per the need. Patients should be instructed not to eat or drink for at least 6 hours prior to the procedure [4].

Procedure: Patient is placed comfortably lying on their side or back, skin is cleaned and draped in a sterile manner. Using

fluoroscopy or ultrasound guided a needle is inserted into the intrathecal space to place the catheter. A small incision is made in the abdomen or side and pocket is created to hold the intrathecal pump. The catheter is threaded from the intrathecal space to the pump which is placed in the pocket, the catheter is then secured to prevent displacement, with suture the incision is closed and dressed.

Post Procedure: Patients are kept in the recovery area for next 2 hours to assess the vitals signs and manage any immediate side effects, initial pain management should be managed by intravenous medications as prn doses and patient should receive discharge instructions on care of the incision site, signs of complications and next follow-up.

Monitoring after Intrathecal Morphine Pump

Miosis

Seizures

CNS depression

Orthostatic hypotension

Bradycardia

Respiratory depression or arrest following a biphasic pattern with initial onset within 1st 3 hours and delayed onset about 6-12 hours after administration. Physicians should avoid additional opioids for the 1st 24 hours after intrathecal morphine administration [5].

Complications of Intrathecal Morphine Pump

Infection: The intrathecal Morphine pump is generally safe and it carries potential risks and complications like site infection may include redness, swelling or discharge. In rare cases infection may spread to cerebrospinal fluid leading to meningitis [6].

Catheter related issues: The catheter can become blocked preventing medication from reaching the intrathecal space, catheter may get displaced leading to inadequate pain control and catheter breakage necessitating surgical intervention for replacement or repair.

Malfunction of the Pump: The device can malfunction due to device failure or battery issues which can result in inadequate drug delivery and requires replacement surgery

Local complications: Rarely bleeding can occur in the intrathecal space during catheter placement, nerve injury during the surgical procedure which can lead to complication such as pain or sensory changes.

Systemic side-effects like allergic reactions, psychological effects like depression or anxiety, respiratory depression, sedation and confusion with high doses or rapid increase in morphine and requires immediate medical attention

Opioid Toxicity

In case of suspected toxicity naloxone, the antidote of opioids is a competitive mu opioid receptor antagonist that reverses

the opioid intoxication. The initial dose for opioid overdose is 0.04mg (IV) which can be increased to every 2 minutes to maximum of 15mg. The onset of action is generally less than 2 minutes and the action is 20 to 90 minutes often requiring redosing or infusion necessary [7].

Follow up Intrathecal Morphine Pump

Regular appointment: Initial follow-up is often scheduled within a few weeks after surgery, with subsequent visits every 1 to 3 months depending on patient's needs and medication regimen [8].

Dosage adjustment can be individualized on patients' response, additional medications may be adjusted to optimize pain control. The pump will require refills of medications every few weeks to months as per the machine capacity and drug delivery mechanism.

Complication monitoring should be done on regular intervals for signs of site infection, pump functions, catheter functionality for blockage, migration or dislodgement, patient should be assessed for adequate pain control, sudden changes in pain or any new neurological symptoms.

Education and Support: Patient should be assessed for quality of life including emotional and psychological wellbeing related to chronic pain and ongoing treatment, support groups or resources for patients living with chronic pain can be helpful. Continuous education about regular follow-up, adherence to regular follow-up clinics and intrathecal pump care should be educated to patient on every visit.

Multidisciplinary approach: Pain and Palliative Care specialists, Psych oncologist and Psychologist can be involved for total care of patients.

Long Term Monitoring: Comprehensive assessment to evaluate long term effectiveness, individualized treatment plans and address any emerging issues.

Conclusion

Intrathecal Morphine pump is generally safe for adequate pain control for patients who does not respond to oral or intravenous morphine or has developed severe side effects to systemic opioids, it can be individualized according to the patients age, weight and need of analgesics, dose adjustments can be done easily in outpatient clinics. The pump delivers

medication directly into the cerebrospinal fluid providing significant pain control for conditions such as cancer pain and chronic pain syndromes. Regular monitoring and follow-up are crucial to ensure optimal pain control and manage any complications. In conclusion intrathecal morphine pump can significantly improve the quality of life and overall wellbeing and functionality of patients. A thorough assessment, continuous patient education and collaborative treatment approach are crucial for ensuring best outcomes for pain relief.

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