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Complications of spinal infusion therapies

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The infusion of opioids and other analgesics into the intrathecal and epidural spaces has been a mainstay in the management of malignant and nonmalignant chronic pain. Although rare, serious adverse events can occur with spinal infusions. The intrathecal route of administration of spinal medications appears to be more efficacious and is associated with a lower incidence of complications than the epidural route. Internalized systems are similarly superior to percutaneous systems. Careful patient selection and preprocedure evaluation may help improve the outcomes. Strict adherence to aseptic techniques and guidelines to neuraxial procedures in anticoagulated patients are essential to help avoid major complications of spinal infection and bleeding. A high index of suspicion for potential serious adverse events should be maintained when following up patients with implanted devices, as serious neurologic deterioration can occur when complications are not promptly recognized and treated.

The infusion of opioids and other analgesics into the intrathecal and epidural spaces has been a mainstay in the management of malignant and nonmalignant chronic pain. The intrathecal and epidural delivery routes are indicated for patients with intractable pain after other more conservative approaches have failed, including percutaneous interventions and medications delivered by other routes.[1] Care must be taken in patient selection, placement of catheters and pumps, as well as the management of the analgesics to avoid potentially devastating complications.

Epidemiology of complications

Assessing the overall rate and incidence of complications related to the infusion of medications into the epidural and intrathecal spaces is difficult and likely inaccurate. We rely on self-reporting to collect data regarding complications. Other sources of information are the closed claim analysis evaluations from the American Society of Anesthesiologists.[2] This information is helpful, but is not available for several years after events occur and encompasses only a small percentage of patients with adverse events. Peer review as well as morbidity and mortality conferences provide an opportunity to report complications but are usually not available for review. Based on these issues, the true incidence of complications is unknown at this time.

The literature does give us some insight into adverse events associated with these techniques. Nitescu and coworkers tested the concept that externalized tunneled intrathecal catheters may lead to a high risk of complications.[3] The study was a prospective, cohort, nonrandomized, consecutive, historical control trial of 200 adults with refractory cancer pain who were treated with the infusion of intrathecal medications for 1 to 575 days with a median of 33 days. The system functioned normally in 93% of patients compared with 31% to 90% previously reported in the literature.[4,5] Postdural puncture headache occurred in 15.5% of

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patients. Infectious complications were grouped into 5 categories, including epidural abscess, meningitis, catheter track infection, systemic infection, and local skin infection. The numbers of clinically significant infections were minimal. One patient experienced a local skin infection for a total of 1 day out of 7424 total infusion treatment days. Hematoma occurred in 0.5% of patients, and catheter migration occurred in 5.5% of patients. Other complications, such as external leakage of CSF, skin breakdown, and pain on injection, were reported but caused no long-term sequelae. None of these patients had a diagnosis of intrathecal inflammatory mass or granuloma. The authors concluded that the use of externalized tunneled intrathecal catheters is a relatively safe modality to treat pain.

Patient satisfaction and efficacy

Concerns regarding complications, such as infection, inflammatory mass, mechanical failure, and other adverse events, have led some clinicians to avoid the use of intrathecal infusions. These worries must be balanced with the possible improvement in analgesia, function, and quality of life as compared with other routes of delivery that require much higher doses of medication to achieve equipotent doses. In a study involving the Montpellier Cancer Institute between 1991 and 1994, 50 patients having refractory cancer pain were treated with a continuous intrathecal infusion of morphine using an external pump with patient-controlled boluses. During the treatment period, which ranged from 7 to 584 days with an average of 142 days, no clinically detectable infections and no respiratory depression occurred. The most common complication in this group was postdural puncture headache, which occurred in 12% of patients and was self limited. The authors concluded that the long-term use of intrathecal morphine infusion seems to provide satisfactory analgesia, few side effects, and a high degree of patient autonomy.[6]

Epidural versus intrathecal complications

In a study comparing epidural and intrathecal infusions, both modalities were reviewed in 140 patients with cancer-related pain syndromes.[7] The authors evaluated the prevalence of complications in terminally ill patients receiving spinal morphine by epidural or subarachnoid catheters. Thirty patients received intrathecal morphine by infusion, and 110 patients received epidural morphine by bolus or infusion. During the first 20 days of treatment, a significant difference in the incidence of complications was observed between the epidural group (8%) and the subarachnoid group (25%). During the remainder of the treatment period, the complication rate rose to 55% in patients receiving epidural morphine and declined to 5% in the subarachnoid group which was statistically significant. The most frequent complication in the epidural group was obstruction and dislocation of the catheter, which was attributed to fibrosis in the epidural space. This problem became apparent in 50% of patients during the treatment period from day 20 to 366. In patients receiving subarachnoid morphine, the prevalent complication was CSF leakage, which was observed only during the first 2 weeks of treatment. The authors concluded that the subarachnoid route is preferred for patients expected to live longer than 1 month.

Another study that was a prospective, cohort, nonrandomized, consecutive trial by Dahm and coworkers compared the complication rates of intrathecal and epidural routes of administration for noncancer-related pain patients.[8] The authors also compared the complication rates associated with externalized and internalized infusion pumps. The intrathecal approach was associated with higher rates of satisfaction with respect to pain relief for both externalized (95% versus 42.5%) and internalized (89% versus 59%) catheters. There were higher rates of treatment failures with externalized epidural catheters than with internalized intrathecal catheters (51% versus 11%), and lower rates of treatment failures with internalized intrathecal catheters than with internalized epidural catheters (11% versus 38%). More internalized epidural catheters required system replacement than internalized intrathecal catheters (72% versus 12%). More internalized epidural catheters had to be removed than internalized intrathecal catheters (45% versus 10%). There were higher rates of catheter-related complications with epidural than with intrathecal catheters, including dislodgement, leakage, and obstruction. The authors concluded that internalized intrathecal drug delivery systems are more effective and safer than epidural or externalized spinal drug delivery systems.[8]

Complications of epidural infusions

Medication-related complications

Respiratory depression, urinary retention, and pruritis are side effects of spinal opioids.[9-11] These complications are rare in patients who have been chronically exposed to systemic opioids. Epidural infusion of local anesthetics are associated with hypotension, sensory loss, proprioceptive changes, and motor weakness.[12] The risk of hypotension is increased in patients with hypovolemia. Inadvertent intrathecal or intravascular injection of epidural doses of local anesthetics have resulted in fatalities.[13] The risks of these events can be reduced by performance of epidurography and by giving a small test dose of local anesthetic with epinephrine to identify improper catheter placement.[14,15]

Spinal epidural hematoma

Localized bleeding as a result of trauma by the epidural needle or cannulation of an epidural vessel by a catheter is