

## **Spinal Drug Delivery Systems**

A spinal drug delivery system infuses medicines directly into the spinal fluid and to the spinal cord. Cells that have a big influence on the perception of pain are located in the spinal cord, and this direct delivery can have a very potent and profound pain-relieving effect. These benefits are achieved at total daily dosages that are much lower than it would take to get the same effect from pills, which also typically limits the side effects often seen with oral medications. When you take pain medication by mouth, only a small portion of the drug molecules actually reach the sites in the brain and spinal cord where they exert their powerful effects. Your liver metabolizes a lot of the medication before it can even get to where it's going, and your circulatory system sends those drug molecules everywhere in your body—even your hair—so it gets heavily diluted. Drug molecules that treat pain typically work on the central nervous system and have to penetrate the blood-brain barrier before they can exert their effect. These obstacles can sometimes be overcome by increasing the dose, but this also increases the side effects, including decreased cognition and increased drowsiness.

## **Getting Started with Spinal Drug Delivery Systems**

Patients with persistent severe and disabling pain or who experience serious side effects from oral medications are the typical candidates for this type of therapy. While not a panacea, for selected patients' intrathecal drug delivery can make a world of difference. It will likely not be the first treatment your doctor tries as it is typically reserved for failure of more conservative treatment

As with any approach, it's not realistic to expect 100% relief, intrathecal drug therapy doesn't solve the problem that produced the pain in the first place but serves instead to change the perception of the pain that results from the condition.

This therapy is particularly expensive to start, but it's usually cheaper to maintain than oral medications. Periodic refills are required typically every 2-3 months but these refills are generally cheaper in the long-run than pills, so these devices can ultimately result in an overall savings in health care costs. Because of the high initial cost, Medicare programs and most insurance companies require a psychological evaluation and intrathecal trial first. The psychological examination will screen for conditions, like severe uncontrolled depression, a factor that can be a barrier to effective pain management.

Your doctor will place medication into your spinal canal as a test to determine whether this therapy helps your pain. The trial period can last anywhere from a few hours up to a week, depending on the technique your physician uses. Some patients find it helpful to write down their experiences during the trial period so they can compare it to their usual pain. If the trial period proves successful, you and your doctor will decide together whether to place a more permanent system.

## **How it Works**

The system itself consists of a drug pump and a catheter that delivers medication directly into the spinal canal. Typically the catheter is placed into the subarachnoid space where the medication

goes directly into the spinal fluid which bathes the spinal cord in fluid; this is known as an intrathecal drug delivery system.

Permanent intrathecal drug delivery systems are totally implanted under the skin, both the pump and the catheter. You don't see the device directly, but the pump, which is about the size of a hockey puck, will be visible if you are thin or even of moderate build. Your body size will determine how much it protrudes and how well you can hide the pump. A programmable pump can be reset by sending messages to the pump with radio waves, thereby allowing the physician to change the daily dosage without touching the patient.

As of 2010, the Food and Drug Administration has officially approved three medications for use in these systems, morphine, ziconitide, and baclofen, but other medications are frequently and safely used to optimize pain control. Commonly used narcotic-type medications include morphine, dilaudid, fentanyl, and occasionally sufentanil. Other adjuvant medications frequently used include bupivacaine (a local anesthetic) that seems to help lower narcotic requirements, clonidine for neuropathic pain, and baclofen for muscular spasticity. ziconitide was the last intrathecal drug to be approved by the FDA, and seems to be most useful for neuropathic pain. Note this medication is very expensive and requires more frequent refills; it is typically used when other medications are not effective.

## **Side Effects and Complications**

As effective as these spinal drug delivery systems can be, they can have side effects and complications too. There are risks associated with the anesthesia and surgery needed to get the device into your body in the first place. If the system becomes infected it's usually very difficult to treat with antibiotics because the body cannot effectively fight the bacteria that accumulate on the surface of the implant. If infection occurs, the system will probably have to be removed. The side effects of the drugs used in these systems are pretty much the same as when these same drugs are administered by other means. However, because it's possible to get better pain relief with drugs given into the spinal canal at much lower dosages, you may find you have less severe side effects with a spinal drug delivery system. A commonly quoted rule of thumb is that you can get as much pain relief from one milligram of morphine delivered directly into the spinal fluid as you can from taking 200 to 300 milligrams a day by mouth!

There are two complications that are more or less specific to these systems. One is that delivering drugs in this way can produce persistent swelling in your ankles, called edema. Trying different drugs or combinations of drugs may be required to manage the problem. Some patients may need to take water pills to help them eliminate the extra fluid. In more severe cases, dosages may need to be lowered or the therapy discontinued. A second and common problem is hypogonadism or suppression of testosterone levels in the body (intrathecal narcotics can also effect estrogen levels but this appears to be less common). Note: Hypogonadism can occur in anyone receiving long-term, moderate to high dosages of narcotics via any delivery approach (oral, transdermal, or intrathecal). A less common problem is chronic urinary retention (difficulty emptying the bladder); this can also lead to fluid retention.