INNOVATIONS
IN SPINE & BRAIN TREATMENT
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Neurosurgery
Compassion, commitment
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VOLUME 1, NUMBER 5

What surgery can accomplish that pain medications alone cannot

Scientists continue to puzzle over the question of why a synthetic derivative of the deadly toxin produced by a giant South Pacific sea snail is able to provide complete, long-lasting relief from severe chronic pain for some adults but not others.

It is an intriguing mystery, one that hopefully will soon be solved – especially since considerable time has lapsed since the federal Food and Drug Administration gave its blessings to this particular painkiller.

The medication in question is ziconotide. Ziconotide prevents fusion of the presynaptic membrane with the neurotransmitter vesicle, and it accomplishes this by blocking presynaptic calcium influx at the presynaptic terminal.

In the literature have been case reports of some patients experiencing complete pain relief following high-dose ziconotide infusion. The astounding part is that severe central nervous system toxicity accompanied their high dosing, which forced these patients to discontinue the regimen – but then, after the side effects dissipated, they experienced the onset of complete pain relief.

Researchers have yet to adequately explain this phenomenon, nor do they understand why ziconotide works only for certain patients and not others.

Has FDA approval

Ziconotide has been given to patients who are intolerant of or refractory to other treatments. The FDA-approved means of delivery is via intrathecal therapy.

Intrathecal delivery of pain medication is scientifically well-established. The technique results in medication being administered to the intrathecal space surrounding the spinal cord.

In so doing, the medication is able to directly bathe the receptors of the spinal cord. Pain relief is thus achieved with smaller doses of medication than might otherwise be necessary.

Intrathecal delivery can be accomplished with any of several FDA-approved types of devices. In the catalog of devices intended for short-term application are implantable ports and short-term catheters with friction connectors; devices for long-term use include non-kinking, wire-supported catheters and silicone catheters.

One of the more popular setups is an intrathecal catheter connected to an implanted reservoir-and-pump device. Typically, the pump is implanted in the abdominal area, just above or below the belt line.

Prior to activation, the battery-powered pump's reservoir is filled by needle injection with the physician's prescribed choice of medication (which can be anything from clonidine to codeine). The reservoir access port is concealed just beneath the surface of the skin (which means refilling must be performed in a clinical setting); the reservoir is large enough to hold a two- to six-month supply of medication.

Some pumps are programmable and can administer the medication in infusion mode or as a bolus.

Blocking pain without drugs

Another chronic-pain management strategy centered on the spinal cord employs the modality of neurostimulation.

Neurostimulation, as the word implies, entails stimulation of the peripheral nerve to scramble or entirely block pain signals en route to the brain.

The biggest advantage of this device is it controls pain without use of medications – invaluable in cases where the patient's condition has become refractory even to opioids given at the highest safe dose.

Like the intrathecal pain pump, a neurostimulator is an implanted device. It consists of an electrically powered signal generator and a lead wire, the latter positioned in proximity to the spinal cord. When the device is activated, the lead carries electrical impulses to the spinal cord. It is these impulses that interfere with the transmission of pain signals.

Neurostimulators usually come with a programming unit carried in the patient's pocket or in a belt-worn pouch. It permits the patient to adjust the strength and spread of the electrical pulses to provide more or less pain-signal scrambling as desired for the right level of comfort. (If there is not much pain present and the pulse strength of the device is set too high, the patient feels an annoying vibration or buzzing sensation in the back.)

Facing something unpleasant

Not all forms of chronic pain must traverse the spine to reach the brain. A prime example is trigeminal neuralgia.

Trigeminal neuralgia is caused by mechanical compression of the face's trigeminal root. The source of this compression is usually a neighboring artery.

The condition is characterized by paroxysms of pain occurring in any or all of the trigeminal nerve's three branches. The pain can manifest as a sharp, piercing sensation. Initial attacks may last a few seconds or several minutes; they have been known to continue for up to an hour. As the condition progresses, the pain tends to become constant but dull.

When medications fail to work, there are surgical interventions for trigeminal neuralgia. One common but invasive approach involves opening the posterior of the head to access

the affected nerve; arterial compression is addressed by inserting a tiny cushion between the trigeminal nerve and the involved artery. This procedure is exceptionally effective – in nearly all instances, the facial pain is completely eliminated. However, it is contraindicated for the elderly and others who cannot physiologically tolerate open surgery. For them, there is an outpatient percutaneous procedure wherein a needle is inserted through the base of the skull to permit injection of glycerol directly to the affected nerve (this numbs it sufficiently to quell the pain for a good three to 12 months).

There are other conditions besides trigeminal neuralgia for which surgical nerve decompression is useful. One of these is complex regional pain syndrome that occasionally develops following upper-extremity surgery. Traditionally, surgical treatment has been avoided in patients with complex regional pain syndrome, but new findings suggest nerve decompression may hasten recovery, according to Washington University researchers writing in the January 2005 issue of *Journal of Hand Surgery*. Then, too, there are the more familiar sources of nerve irritation originating along the spine from conditions such as disc rupture, stenosis, spondylosis and bone spurs.

Conclusions

Neuropathic pain that becomes refractory to oral or topical medications can be managed by means of a surgically implanted intrathecal system to deliver medication directly to the spine area. This strategy allows the patient to experience pain relief using substantially smaller doses of medication and spares them from feeling "foggy" all the time (which means they are better able to engage in an active life).

Also available are neurostimulators. These implantable devices create around the spinal cord an electrical field that blocks transmission of pain signals to the brain.

Trigeminal neuralgia – facial pain – is the result of a malfunction of the trigeminal nerve, most often produced by arterial compression. This condition can be treated medically or, when indicated, surgically.

In my conveniently accessible private practice, all of these leading-edge approaches for treating neuropathic pain are offered. Only university-based academic practices can provide comparable care.

Something my training at the Mayo Clinic and years of experience involving these cases has taught me is the need to be responsive and accessible to referring physicians. Accordingly, it is customary for me to keep them informed of their patients' progress, beginning with a detailed report issued promptly after the initial consult and continuing with a letter following each successive visit. Referring physicians also receive from me a phone call after surgery to apprise them of the results and discuss any pertinent details. Moreover, I take the time to inform patients and answer all their questions in terms they can understand.

Physicians in Milwaukee, Waukesha and neighboring Wisconsin communities appreciate this about my approach to practice and as such are choosing to refer to me in growing numbers their neuropathic chronic-pain patients. They do so with confidence because they know that the services and support I provide will deeply satisfy their patients. I can accomplish the same for your patients, who, when they later return to you for follow-up and routine care, will be more willing than ever to continue their relationship with you, knowing clearly that you are championing their health interests and that their trust is not misplaced.

For further information about my pain-relief surgeries and related interventions, please call me at (262) 717-9850.

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