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GOODnews

page 3
Congratulations to the Good Sam Bike Jam team winners!

page 5
2 new operating rooms open to meet growing community demand

page 7
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Exempla Good Samaritan MEDICAL CENTER Foundation

***Dr. Lee Nelson** with Boulder Neurosurgical & Spine Associates (foreground) and **Dr. Avrom Kurtz** with Exempla Foothills Neurology Associates review a 3-D image of the brain in preparation for deep brain stimulation surgery.*

Deep brain stimulation offers life-changing treatment for Parkinson's disease

For patients who suffer from Parkinson's disease and are unable to control their symptoms with medication or have endured severe medication complications – there is hope.

It comes in the form of a new surgical procedure called deep brain stimulation.

Deep brain stimulation is an FDA-approved procedure that uses a surgically implanted, battery-operated neurostimulator. Similar to a heart pacemaker, the neurostimulator delivers electrical stimulation to targeted areas in the brain that control movement.

The neurostimulator blocks abnormal nerve signals that cause the debilitating tremors, stiffness and slowness of movement associated with Parkinson's disease. The procedure is also effective for treating essential tremor, which causes involuntary shaking.

Currently, Exempla Good Samaritan Medical Center is the only hospital in northern Colorado to offer deep brain stimulation.

The procedure involves a multistep process coordinated through neurosurgeons **Dr. Lee Nelson** with Boulder Neurosurgical & Spine Associates and **Dr. Avrom Kurtz** with Exempla Foothills Neurology Associates.

Continued on page 4

Deep brain stimulation

Continued from page 1

How it works

The first step in deep brain stimulation is an evaluation to verify that the patient has Parkinson's disease or essential tremor.

After the diagnosis is confirmed, the neurosurgeon uses an MRI (magnetic resonance imaging) and CT (computed tomography) scan to find out the exact location in the brain where the symptoms originate.

In Parkinson's disease, the subthalamic nucleus, which is deep inside the brain, is overactive – causing tremors, rigidity and slowness of movement.

A week before the surgery is performed, Dr. Nelson inserts three or four small screws, called fiducial markers, into the skull to serve as a base for a custom-fit surgical platform, which will guide the electrode to its precise target in the brain.

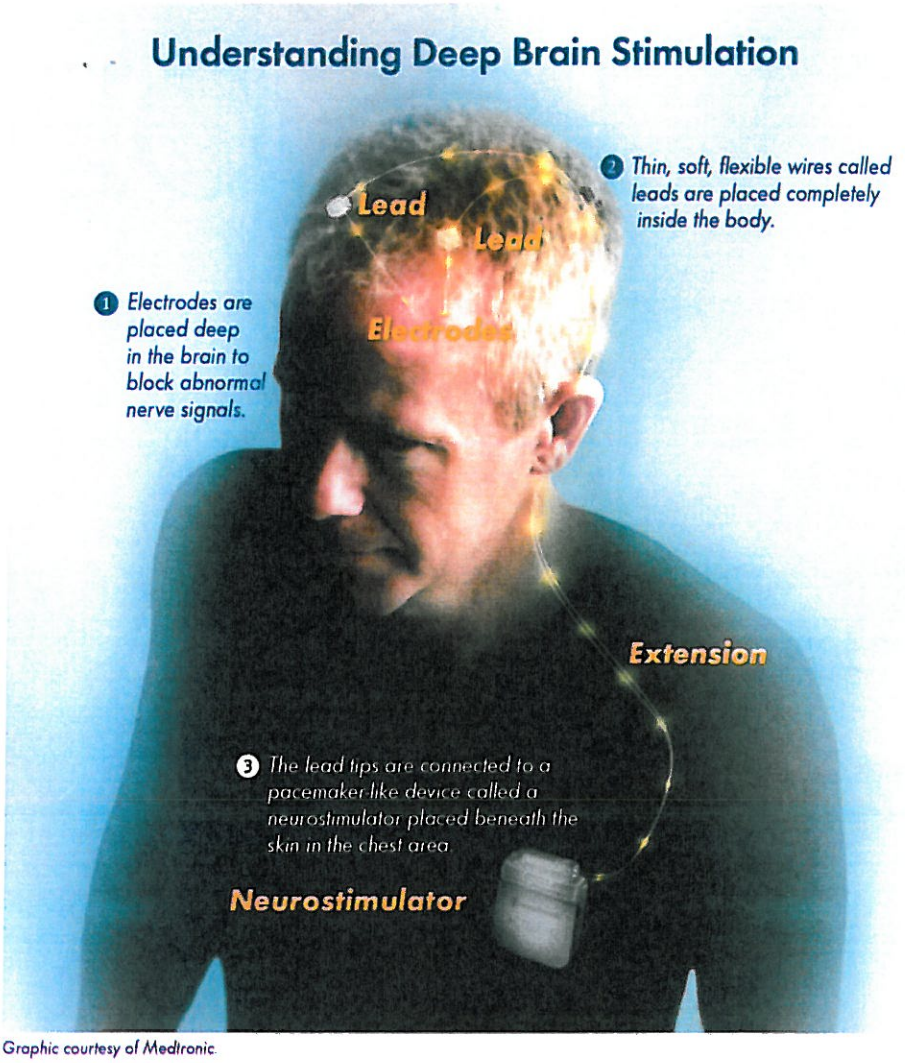
During surgery, a recording lead or electrode, which is a thin insulated wire is inserted through a small opening in the skull and implanted into the brain.

Placing the lead into the brain's subthalamic nucleus requires 3-D visualization that delivers pinpoint accuracy to make sure the electrode does not run into arteries or veins. One minor misstep could damage brain function.

The recording lead allows the neurosurgeon to actually "hear" the overactive brain activity and determine how far the electrode needs to be placed inside the brain's subthalamic nucleus in order to block its overactive impulses.

Awake and responding

One unique aspect of the surgery is that the patient is awake and asked to perform simple movements such as tapping a finger during the procedure.



Graphic courtesy of Medtronic.

By activating the neurostimulator and sending an electrical impulse into the brain, Dr. Kurtz tests the patient's movements to make sure the patient is responding appropriately and that the neurostimulator is working.

Once the testing is complete, a permanent lead is place inside the brain that will connect to an extension wire that is passed under the skin of the head, neck and shoulder.

The extension wire connects to a neurostimulator battery pack, which is usually implanted under the skin near the collarbone in a separate procedure.

After the neurostimulator battery pack is inserted, the patient returns to see Dr. Kurtz so that he can turn the device on and adjust electrical impulse voltage accordingly.

Dr. Kurtz says adjusting the neurostimulator's electrical voltage and decreasing the patient's Parkinson's medication is a balancing act that may take a few visits before the patient is stabilized.

Once final adjustments are completed most patients are able to reduce their medications by around 65 percent and some can go off medications entirely.

The entire process typically takes up to three months including inpatient surgery to insert the lead and outpatient surgery to connect the lead's extension wire to the neurostimulator battery pack.

The end result for most patients who have deep brain stimulation is life changing.

"This is a dramatic treatment, but patients tend to do really well and are extremely satisfied with the end result," Dr. Kurtz said.