

New device implanted by surgeons help paralyzed patients breathe easier

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Physicians at UT Southwestern Medical Center soon will begin implanting a new device designed to improve breathing in patients with upper spinal-cord injuries or other diseases that keep them from breathing independently.

UT Southwestern University Hospital - St. Paul is only one of only two sites in Texas and one of 25 in the country currently equipped to implant the device, called the NeuRx Diaphragm Pacing System.

The device is designed to give patients more freedom and to help slow respiratory decline. Patients who have diseases or injuries that affect breathing muscles, such as the diaphragm, are more prone to lung infections because of their weakened ability to inhale and exhale sufficiently, said Dr. Michael DiMaio, associate professor of cardiovascular and thoracic surgery at UT Southwestern.

"Patients who have high-level spinal-cord injuries are unable to breathe efficiently because the nerve signals no longer function," Dr. DiMaio said.

The diaphragm separates the abdomen and chest cavity and contributes to 80 percent of [respiration](#). Nerve signals from the brain tell it when to expand and contract. When it expands, pressure inside the chest is reduced and air rushes into the lungs. When the diaphragm relaxes, the lungs and chest wall push air out.

People with spinal-cord injuries that interfere with breathing are typically placed on external mechanical ventilators that support breathing through positive pressure via a tube placed directly into the airway through the front of the throat.

The [implantable device](#), manufactured by Ohio-based Synapse Biomedical, was approved by the [Food and Drug Administration](#) in 2008. The NeuRX system includes four electrodes that are implanted directly into the diaphragm. Electrical signals from an external control device induce impulses from the phrenic nerve, which runs from the spine to the diaphragm. Once those signals reach the electrodes in the diaphragm, the muscle is stimulated to expand and contract. This action more closely simulates normal breathing than external ventilators.

"This device has some advantages over traditional ventilators," Dr. DiMaio said. "Patients have more mobility because they don't have an external ventilator to carry around, and the surgery to implant the device is less invasive than previous treatments."

Researchers said they hope the new device can improve quality of life and decrease incidents of infections that can affect patients who are on external ventilators. Prior generations of phrenic nerve stimulators were inserted by making an incision in the neck and chest. Electrodes were then placed directly on the nerve, rather than the diaphragm.

"Although phrenic nerve stimulation as a way to induce breathing in these patients isn't a new concept, we think the NeuRX will alleviate some symptoms present with previous stimulators," said Dr. Jose Viroslav, professor of internal medicine at UT Southwestern and pulmonary and critical care specialist. "One of the problems that arose before was scarring and fatigue of the phrenic nerve. This stimulator is placed on the diaphragm, and the pulses are more diffuse."

Dr. Viroslav said another major advantage with the NeuRX device is that it helps with speech.

"Patients on diaphragmatic pacers have more of a normal ventilation, and their vocal cords are not bypassed therefore they can talk," he said. "Breathing with the diaphragm is normal, and if you can do it with implantable electrodes, you are closer to [breathing](#) normally with the advantages of speech, less infection, and more mobility."

Source: UT Southwestern Medical Center ([news](#) : [web](#))

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