Thalamic responsive neurostimulation reduces seizures by over 80% in pediatric patients

Children's Hospital Los Angeles (CHLA), USA

Over the past two years, a Children's Hospital Los Angeles team has treated 10 children with thalamic responsive neurostimulation (RNS), a groundbreaking therapy for generalized epilepsy as well as Lennox Gastaut syndrome.

The implanted device can reduce seizures by an average of 80% to 85%-with the majority of people experiencing a greater than 90% reduction-offering a critical option for children who have not responded to other therapies.

Thalamic RNS allows us to target and modulate a seizure network without removing any brain tissue. For patients with generalized epilepsy, it has been a game-changer."

Virendra R. Desai, MD, Surgical Director of the Level 4 Comprehensive Epilepsy Center in the Neurological Institute at CHLA

As experience with thalamic RNS grows, Dr. Desai and pediatric neurologist Asri Yuliati, MD, share key insights and how the treatment is evolving.

CHLA's initial thalamic RNS patients had already undergone vagus nerve stimulation (VNS) because that was the established option available at the time. Now, some families are choosing RNS first.

"You don't have to try and fail VNS to be eligible for RNS," says Dr. Yuliati. "It's an individualized treatment decision with each family."

And while families and even some physicians assume that VNS is safer because it is placed in the neck rather than the brain, the risks are actually comparable, Dr. Desai says.

"The risk of complications from both VNS and RNS is very low," he says. "Due to detailed preplanning and advanced robotics, the risk of bleeding and infections with thalamic RNS is less than 1%."

Seizure control often improves over time

One interesting aspect of RNS in general is that outcomes can continue to improve after the first year.

"The device seems to initially treat seizures more acutely, responding to the EEG signals and then aborting the seizure," Dr. Yuliati says. "But there are data showing that, over time, the device begins to modulate the broader network."

Long-term studies in adults with focal epilepsy have shown that seizure reduction can continue to improve for years after RNS implantation. At nine years, patients experienced a median seizure reduction of 75%, and 35% had at least a 90% reduction.

RNS targeting and programming continue to evolve

Because thalamic RNS is still relatively new in pediatrics, physicians are continuing to learn how best to personalize the therapy for each patient.

"There are different nuclei in the thalamus, and we're still learning which is the best target," Dr. Yuliati says. "We're also learning how to optimize stimulation programming for each child."

Another challenge is that RNS currently requires considerable family participation, including uploading device data and returning regularly for programming adjustments. But Dr. Desai believes future advances will likely make this process more manageable for families, expanding access to more children.

A child with a normal MRI can still be a candidate

Dr. Desai stresses that children who have a normal MRI, or an EEG showing generalized, multifocal, or bilateral seizure onset, can still be candidates for thalamic RNS.

"Standard MRIs can miss subtle abnormalities, and more advanced testing can give us a much more precise picture of where the seizures are coming from," he says. "And even if the seizures are generalized, thalamic RNS could be an option."

Regardless, once children have failed two anti-seizure medications, they should be referred to a Level IV pediatric epilepsy center. At CHLA, a multidisciplinary team performs a comprehensive evaluation and develops an individualized treatment plan, which could include medication, dietary therapy, or surgical approaches.

"Every child's epilepsy is different, and every treatment is different," Dr. Yuliati says. "It's critical that children are referred in a timely manner so we can find the best possible treatment to stop their seizures."

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