Case Study: Treating Scoliosis with Magnetic Growing Rods

Department of Orthopaedics
Walter P. Samora, MD
Allan C. Beebe, MD

The implantation of either a Vertical Expandable ProstheticTitanium Rib™ (VEPTR) or a growing rod is a common surgical treatment for early-onset scoliosis when curvature is greater than 50 degrees. The VEPTR is a curved metal rod that can attach vertically to the ribs and spine and aids in straightening the spine. A growing rod has a similar purpose, but both ends of the rod attach to the spine. With either device, surgical procedures under general anesthesia are required approximately every six months to manually lengthen the rods as a child grows. Replacement of the devices becomes necessary when the patient outgrows the entire potential length of the rods.

In 2014, the FDA approved an alternative device for some patients. The MAGEC™ (Magnetic Expansion Control) Spinal Bracing and Distraction System also includes a rod that must be implanted, but the need for periodic invasive procedures for manual lengthening is eliminated. Instead, an external remote control causes a magnet inside the MAGEC rod to lengthen the device. This takes place during a short outpatient visit approximately every two months with no anesthesia and little or no pain.

This case study presents the first MAGEC implantation performed at Nationwide Children's Hospital.
Case Study

Presentation:
An 8-year-old male with Pallister-Killian syndrome and associated early-onset scoliosis had outgrown his current dual VEPTR devices and required a revision. The VEPTR rods had been implanted and lengthened at Nationwide Children’s. With previous VEPTR lengthening procedures, the patient had belly and feeding difficulties after general anesthesia, leading to inpatient recovery time of up to one week. Replacing the outgrown VEPTR devices with the MAGEC systems would eliminate the need for general anesthesia during lengthening procedures.

Surgical Treatment:
Both explantation of the VEPTR rods and implantation of MAGEC systems were performed. A distal incision allowed for dissection down to the spine. Pedicle screws at the L4 and L5 vertebrae and set screws were removed. Then a proximal incision with dissection down to the midline gave access to the VEPTR proximal cradles in order to remove the VEPTR rods. The rib anchors were maintained.

Bilateral pedicle screws at L3 and L4 were replaced with slightly larger screws for better purchase. Dual MAGEC rods were then inserted, lengthened and hooked into the already existing anchors.

Follow-Up and Prognosis:
The patient has undergone one lengthening procedure with the external remote control since the surgery. The procedure lasted approximately one minute. The patient is non-verbal, but there was no indication of pain.

The MAGEC rods implanted in the patient allow for 4 centimeters of total lengthening. We intend to lengthen the rods 3 millimeters every two months, giving the current rods a lifespan of approximately 40 months. If spinal fusion surgery is not possible, dissection down to the spine. Patients with other growing rod systems typically have rods lengthened 6 millimeters every six months. Lengthening approximately 3 millimeters every two months is thought to be more natural.

Potential Benefits of Magnetic Growing Rods

Preliminary research analyzing the results of MAGEC implantation has found that the system can successfully control early onset scoliosis up to three years after surgery. The primary benefit for patients with the MAGEC rod compared to those with VEPTR or other growing rods is the avoidance of regular lengthening surgeries. This is particularly important for patients who experience complications with general anesthesia.

The magnetic rod may have the additional benefit of more closely mimicking the growth patterns of the spine. Patients with other growing rod systems typically have rods lengthened 6 millimeters every six months. Lengthening approximately 3 millimeters every two months is thought to be more natural.

Contraindication for Magnetic Growing Rods

The MAGEC system is contraindicated for patients who may require magnetic resonance imaging (MRI) at any time while the system is implanted. For this reason, it is important that orthopedic surgeons remain facile with other growing rod devices.

Recent research, however, has found no detrimental effects of MRI on the MAGEC rod in-vitro.

Magnetic Growing Rods at Nationwide Children’s

Orthopedic surgeons at Nationwide Children’s Hospital perform approximately 10 growing rod device surgeries per year. Since the surgery presented in this case study, four other implantations of the MAGEC system have been completed here. We now routinely present the system as an option for children with early onset scoliosis who have not reached skeletal maturity but would benefit from surgical intervention.

Preliminary research analyzing the results of MAGEC implantation has found that the system can successfully control early onset scoliosis up to three years after surgery. The primary benefit for patients with the MAGEC rod compared to those with VEPTR or other growing rods is the avoidance of regular lengthening surgeries. This is particularly important for patients who experience complications with general anesthesia.

The magnetic rod may have the additional benefit of more closely mimicking the growth patterns of the spine. Patients with other growing rod systems typically have rods lengthened 6 millimeters every six months. Lengthening approximately 3 millimeters every two months is thought to be more natural.