

# Fusionless Corrections of Early Onset Scoliosis

Emma Orton, *Biomedical Engineering, University of Rhode Island*  
BME 281 First Presentation, September 29, 2015 <emma\_orton@my.uri.edu>

**Abstract**—Many children suffer from EOS. There is now a more efficient dual growing rod that can help correct the curve of the back until the patient is fully matured to have their spine fused. Most recently there is a magnetically controlled growing rod that has similar results to the traditional growing rod and does not need a lengthening surgery every 6 months.

## I. INTRODUCTION

Early onset scoliosis is a terrible condition that causes children under the age of ten to undergo either non-surgical or eventually surgical treatments for years until their skeletal system is matured enough. One of the most efficient surgical treatments is the dual growing rod. The DGR recently has been advanced, now allowing the lengthenings to occur without an invasive surgery. This method was only FDA approved in February 2014 in the US. Prior to these methods there were methods using a single rod or doctors had to resort directly to spinal fusion. Receiving a treatment like spinal fusion at such a young age is dangerous as it stunts the axial growth that still has about 12.5 cm of growth when a child is 5 and the thoracic growth in which the lungs do not fully develop till age 8 so stunting growth prior to reaching maturity will cause many pulmonary issues or even an early death. [1]

## II. METHODS

Dual growing rods are placed in the vertebrae at each end of the curved segment. When these rods are implanted they make a large initial improvement in the curve and then after six months the first lengthening surgery must occur this then must occur every six months until they are matured. There is a screw attached to the bottom of the growing rod that allows the surgeon to lengthen the rod without changing it completely. Lengthenings are invasive surgeries with a one to two day recovery in the hospital and then about two weeks of at home recovery before returning to regular life.[1] Magnetically controlled growing rods only require one surgery unless there are complications. The lengthenings occur every 3-4 months and is noninvasive. It happens in a doctor's office using the machine pictured below. Magnets control the lengthening within the body. [2]



[3]

## III. RESULTS

One experiment having to do with the DGR had 38 patients

with the average age of 3.3 years old who received lengthenings every 6.8 months. The Cobb angle decreased from 74 degrees to 38 degrees on average and there was axial growth. In another similar experiment there were 23 patients whose Cobb angle was corrected from 82 degrees to 38 degrees and had an average axial growth of 1.24cm per year and improvement in space in the thorax. Though these results were good there were 13 complications with 11 patients. [2] An experiment was conducted with 24 patients 12 MCGR and 12 TGR patients that were paired together based on the number of rods, the curve, age and the type of EOS. These patients have to be younger than 11, have a major curve of at least 30 degrees, no previous spine surgery and a thoracic height of less than 22cm. The curve correction was very similar between the two types of patient with an average of 32% and 33%. The spinal heights of the two were also very similar, 8.1mm/yr for MCGR patients and 9.7mm/yr for TGR patients. The thoracic height also improved greatly in both studies. The most shocking part of this lab is not the similarity in the results but the difference in the number of surgeries. The MCGR patients had a total of 16 surgeries and 137 noninvasive lengthenings and only 8 implant related complications. The TRG patients had a total of 73 surgeries, 12 for the initial implant and 56 for lengthenings. 11 of the 12 patients had complications, 4 were due to infection at the surgical site and 13 were implant related. There can be a bit of discrepancy with this study only because different doctors conducted each of the surgeries or lengthenings. [4]

## IV. DISCUSSION

The MCGR are basically an adaptation to the DGR. The MCGR gives the patient the ability to have a more normal life without having to go through invasive surgeries every six months that require anesthesia and recovery time. MCGR has very similar results to the DGR but does not cause as much physiological and physical pain and is substantially cheaper. The only major difference between the results of the two methods is that the MCGR does not allow for the sagittal plane to contour as ideally as many doctors would like. This is due to where the actuator has to be located. Although the MCGR is very new and is not yet found in all hospitals it is definitely the better treatment. These patients are young, none over the age of 12 and most under the age of 10, this procedure allows for them to continue growing and living their life. One patient who uses the MCGR explained that after each noninvasive lengthening there is no pain only a bit of a tight feeling.

## REFERENCES

- [1] Hershman, Stuart H., Justin J. Park, and Baron S. Lonner. "Fusionless Surgery for Scoliosis."

*Fusionless Surgery for Scoliosis* (2013): n. pag.  
Web. 22 Sept. 2015.

- [2] "Frequently Asked Questions." *Growing Spine Foundation*. N.p., n.d. Web. 22 Sept. 2015.
- [3] "Controlled Growing Rods Treat Scoliosis in Children." *MedGadget*. N.p., n.d. Web. 22 Sept. 2015.
- [4] Pawlek, Jeff B., and Growing Spine Study Group. "Traditional Growing Rods Versus Magnetically Controlled Growing Rods for the Surgical Treatment of Early-Onset Scoliosis: A Case-Matched 2-Year Study." 2.6 (2014): 493-97. Web.