

# What are the Advantages and Limitations of MCGR?

**11<sup>th</sup> International Congress on  
Early Onset Scoliosis**

**Matthew E. Oetgen, MD, MBA**

*Chief, Division of Orthopaedic Surgery and Sports Medicine  
Children's National Health System  
Washington, DC*



**Children's National™**

# DISCLOSURES

- No financial disclosures
- No conflicts of interest related to this talk
- Professional:

I was trained by CEJ ...so I am a delayer...

but I have implanted about 12 MCGR's...and I like it... **I think!**



# NOMENCLATURE

- MCGR = Magnetically Controlled Growing Rod
- TGR = Traditional Growing Rod

Despite the availability of a variety of MCGR worldwide, in this talk MCGR = MAGEC (Nuvasive, San Diego, CA)\*

\* Unless otherwise specified



# GOALS OF GROWING RODS

1. Deformity correction/control
2. Growth of spine and chest
3. Limited complication of treatment
4. Maximize patient and parent satisfaction

What intervention can deliver best combination of goals



Goals	TGR	MCGR
Deformity	++	++
Growth	+	++
Complications	++	+
Satisfaction	-	++

Not so fast...lets look at the updated data

# DEFORMITY CORRECTION

1. Most correction achieved at initial implantation (techniques are essentially the same)

Study	% TGR Correction	% MCGR Correction
Teoh 2016	30% (n=27)	30% (n=10)
Hosseini 2016		44% (n=15)
La Rosa 2016		58% (n=10)



# DEFORMITY CONTROL

Study	TGR Lost Correction	% MCGR Correction
Teoh 2016	2°	1°
Hosseini 2016		5°
La Rosa 2016		2°



# COMPLICATIONS

## Complications of Growing-Rod Treatment for Early-Onset Scoliosis

Analysis of One Hundred and Forty Patients

By Shay Bess, MD, Behrooz A. Akbaria, MD, George H. Thompson, MD, Paul D. Sponseller, MD, Suken A. Shah, MD,  
Hazem El Sebaie, FRCS, MD, Oheneba Boachie-Adjei, MD, Lawrence I. Karlin, MD, Sarah Canale, BS,  
Connie Poe-Kochert, RN, CNP, and David L. Skaggs, MD

- 81 / 140 had at least one complication (58%)
- 42% required additional unplanned procedure
- Increase in overall complications and wound complication with increasing number of surgical procedures
  - 24% increased chance of complication with each additional surgery
  - 13% decreased chance of complication with each year of age at initial surgery



# COMPLICATIONS

TABLE II Complications for All Patients and Single and Dual-Growing-Rod Groups

	Total	Single Growing Rod	Dual Growing Rods	P Value*
Total no. of complications	177	94	83	NS
No. of patients with a minimum of one complication	81	43	38	NS
No. of complications per patient†	1.2 (0-7)	1.3 (0-7)	1.2 (0-7)	NS
Complication rate per surgical procedure (%)	20	21	18	NS
Wound complications†	23/30 (0-4)	8/9 (0-2)	15/21 (0-4)	30% NS
Infections§				
Superficial	6/6	0/0	6/6	≤0.05
Deep	14/15	6/6	8/9	NS
Other wound problems§	11/13	3/4	8/9	NS
Unplanned surgery due to wound problems#	16/29 (0-4)	7/10 (0-3)	9/19 (0-4)	NS
Implant complications†	63/106 (0-6)	34/64 (0-6)	29/42 (0-4)	61% NS
Hook dislodgement§	30/37	21/27	9/10	≤0.05
Screw dislodgement§	3/5	0/0	3/5	NS
Rod fracture§	34/52	16/30	18/22	NS
Prominent implants§	6/6	2/2	4/4	NS
Other implant problems§	4/5	2/3	2/2	NS
Unplanned surgery due to implant problems#	26/39 (0-3)	19/29 (0-3)	7/10 (0-3)	≤0.05
Alignment complications§	10/11	4/4	6/7	10% NS
Junctional kyphosis§	3/3	1/1	2/2	NS
Curve decompensation§	3/4	0/0	3/4	NS
Other alignment problems§	3/3	3/3	0	NS
Unplanned surgery due to alignment problems#	5/6 (0-2)	3/3 (0-1)	2/3 (0-2)	NS
Neurological complications	4	1	3	4% NS
Surgical or medical complications†	17/22 (0-3)	11/15 (0-2)	6/7 (0-3)	10% NS
Pulmonary problems§	10/10	8/8	2/2	NS
Dural tear§	4/4	3/3	1/1	NS
Other (gastrointestinal, hematoma, estimated operative blood loss of >500 mL)§	8/8	4/4	4/4	NS

# COMPLICATIONS

Do magnetic growing rods have lower complication rates compared with conventional growing rods?

- 10 MCGR vs 27 TGR

Comparison of complications between the MCGR and CGR groups with odds ratio and significance value

	MCGR (N=10)	CGR (N=27)	Odds ratio (95% CI)	p-Value
Complications	9 complication (7 patients)	40 complications (21 patients)	0.67 (0.13–3.40)	.62
Superficial infection	0	16 episodes (11 patients; 41%)	0.07 (0.004–1.29)	.017
Deep infection	1 episode (10%)	10 episodes (9 patients; 33%)	0.22 (0.02–2.04)	.22
Metalwork problems	8 episodes (7 patients, 70%)	14 episodes (9 patients; 33%)	4.67 (0.97–22.46)	.045
Return to theater for unplanned procedures	8 episodes (7 patients, 70%)	18 episodes (12 patients; 44%)	2.92 (0.62–13.75)	.050

- MCGR had higher complication rate per patient year vs TGR ( 0.32 vs 0.15) despite slightly older patient at implantation but also increased “lengthenings”
- **Difference in complications from infection to implant**



# COMPLICATIONS

## Magnetically Controlled Growing Rods for the Management of Early-onset Scoliosis: A Preliminary Report

- 10 MCGR
- 3 constructs had implant issues
  - 2 rod fractures
  - 1 proximal fixation pull-out
- Average follow up 27 months (range: 14-41mns)



# COMPLICATIONS

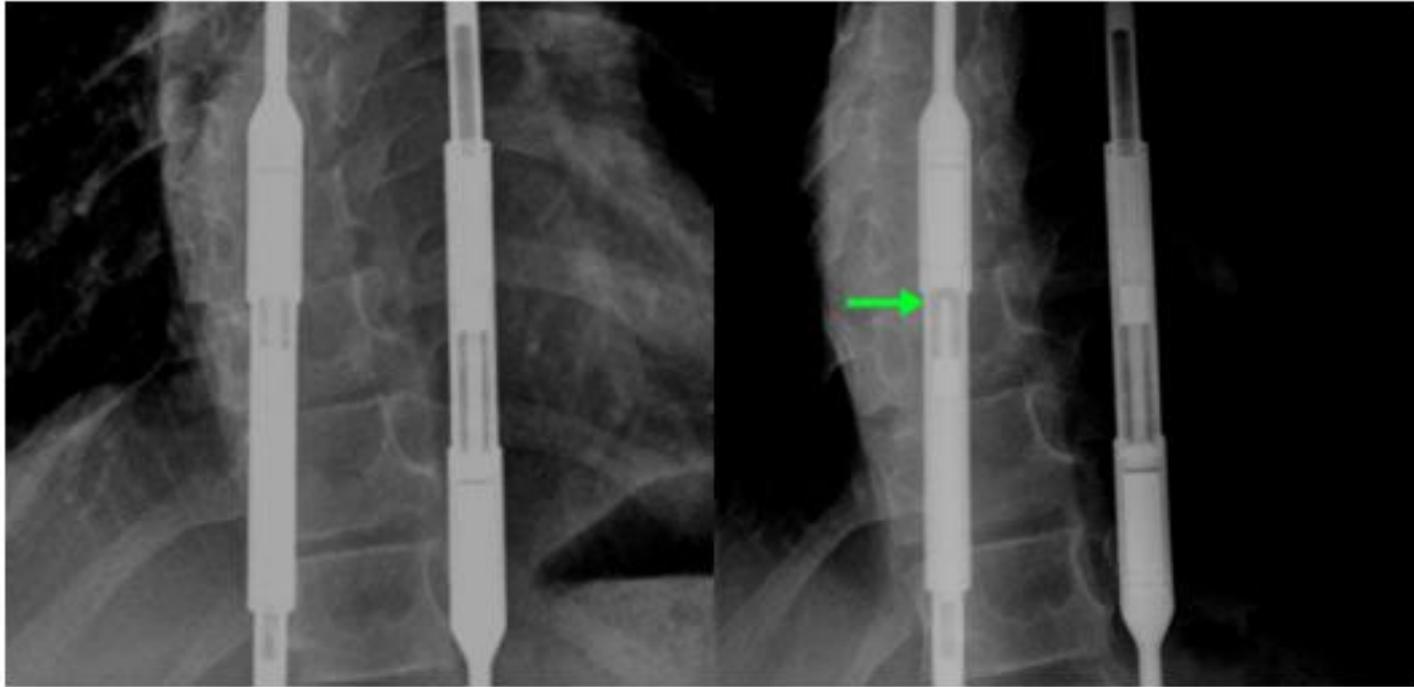
## Magnetically controlled Growing Rods for Early-onset Scoliosis

- 23 MCGR with 2 year follow up
- 41 complications in 23 patients
- 14 (34%) implant related complications
- 27 (66%) non-implant related complications
  - No cases of infection



# COMPLICATIONS

Actuator pin fracture in magnetically controlled growing rods: two cases



- 2 patients out of 9 with MCGR
- Unrecognized by US with lengthenings
- Recommend q 6 month radiographs



# PARENT AND PATIENT SATISFACTION

- Currently little data on this issue
- Study of 19 MCGR vs 25 TGR using EOSQ-24
- Patient reported outcome significantly better for
  - Financial Burden
  - Overall Satisfaction
- *This statistical difference was lost when adjusting for length of follow-up*
- Study performed in Turkey



# The Early Results...

Goals	TGR	MCGR
Deformity	++	++
Growth	+	++
Complications	++	+
Satisfaction	-	++

What about later?

# LONGER TERM OUTCOMES

1. Deformity control and spine lengthening effective with MCGR
2. Have we introduced a new set of complications
  - Rod issues (anchor pullout, actuator pin fracture)
  - Migration from infection to hardware concerns
3. Are the patient reported outcomes really better?
4. Will the cost analyses hold up?



# CONCLUSIONS

1. This is still EOS – This stuff is hard
1. MCGR a new powerful piece of equipment
  1. But likely not a panacea solution
3. Need to understand more:
  - Poor patient characteristics
  - Best lengthening intervals and procedures
4. Delaying still the best technique!

