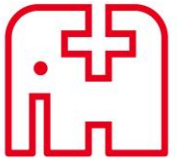
Anchor dislodgement and rod breakage during traditional dual growing rod surgery in early onset scoliosis.

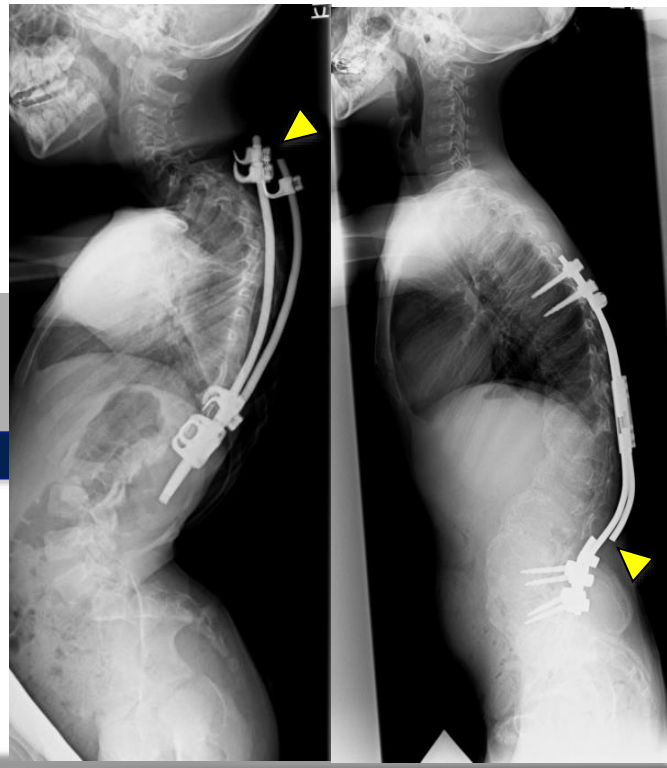
Yoh Fujimoto, Haruhisa Yanagida, Toru Yamaguchi

Fukuoka Children's Hospital, Japan
Department of orthopedic and spine surgery



Introduction

- Sagittal parameter, especially in thoracic kyphosis (TK), is indicated as risk factor for post-operative implant failure in traditional growing rod surgery (TGR).
- On the other hand, there are some reports that it did not related to.

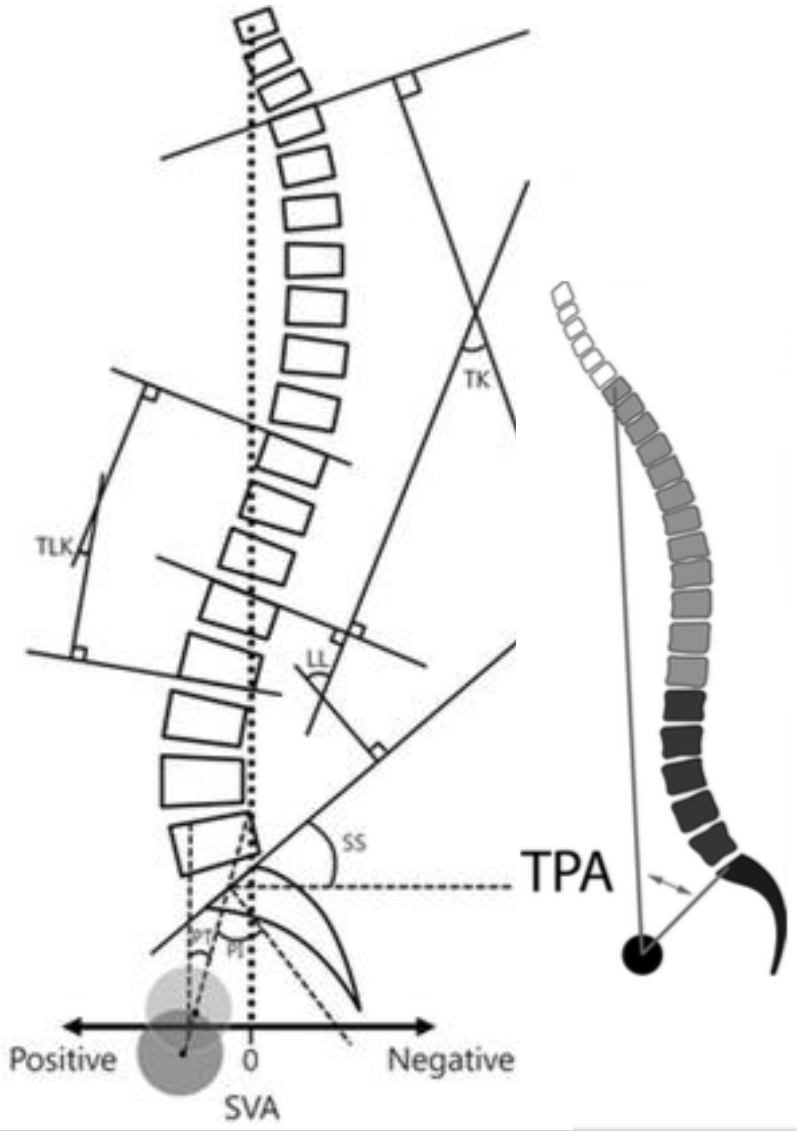


Hypothesis

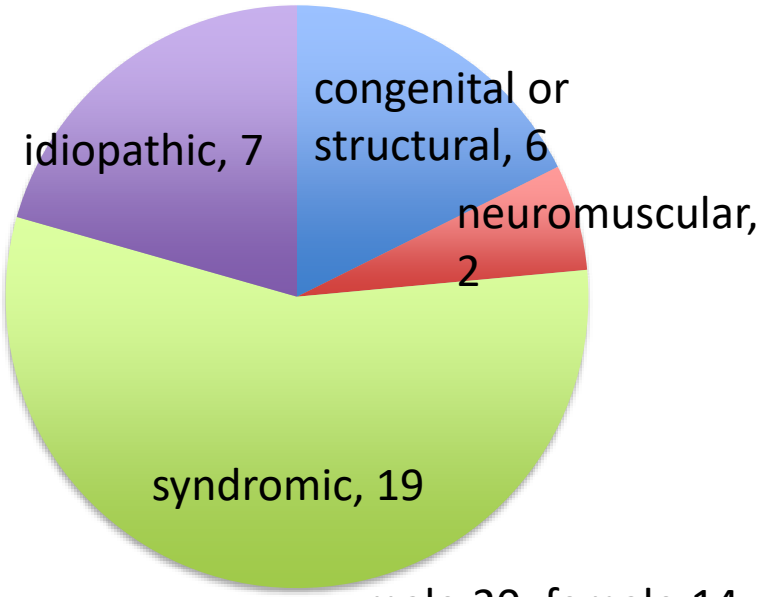
- Sagittal alignment that is not TK is the cause of anchor dislodgement and rod breakage.

Materials & Methods

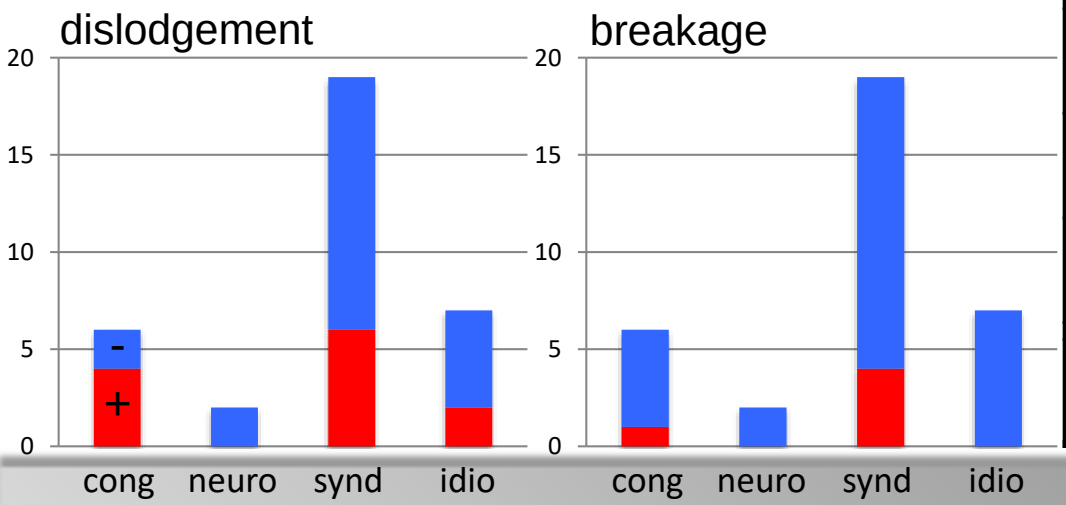
- Thirty-four cases of early onset scoliosis who were performed dual growing rod surgery were included.
- Patients had a minimum of 2 years follow-up.
- Measurement items:
  - PI, PT, SS, SVA,TK (T5-12), LL(T12-S1), and TPA



Result: overall (n=34)



male:20, female:14

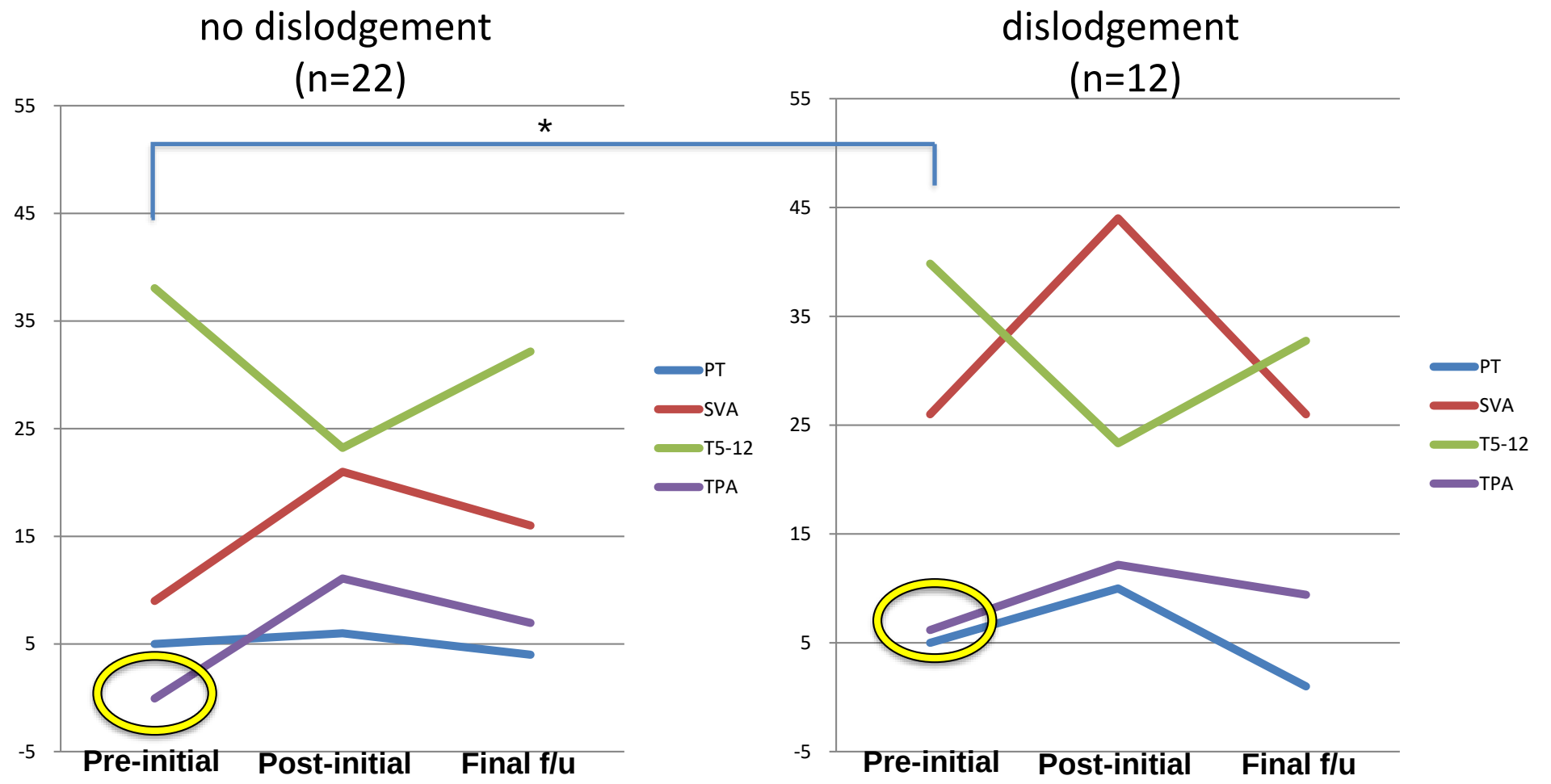


Age at initial surgery (y.o)	8.5
Follow up period (y)	7.0
Total number of surgery	277
-average	8.2
Total number of lengthening	226
-average	6.7
Unplanned surgery (cases)	14
-anchor dislodgement	12
-rod breakage	5
Final Fusion	9

Result: Anchor dislodgement

pre-initial	**dislodge (-) (n=22)**	**dislodge (n=12)**		***post-initial***	**dislodge (-) (n=22)**	**dislodge (n=12)**	
PI	44	44	NS	PI	45	45	NS
PT	5	5	NS	PT	6	10	NS
SS	40	39	NS	SS	39	34	NS
SVA	9	26	NS	SVA	21	44	NS
TK	38	40	NS	TK	23	23	NS
LL	54	52	NS	LL	47	41	NS
TPA	0	6	p<0.01	TPA	11	12	NS

Result: Anchor dislodgement



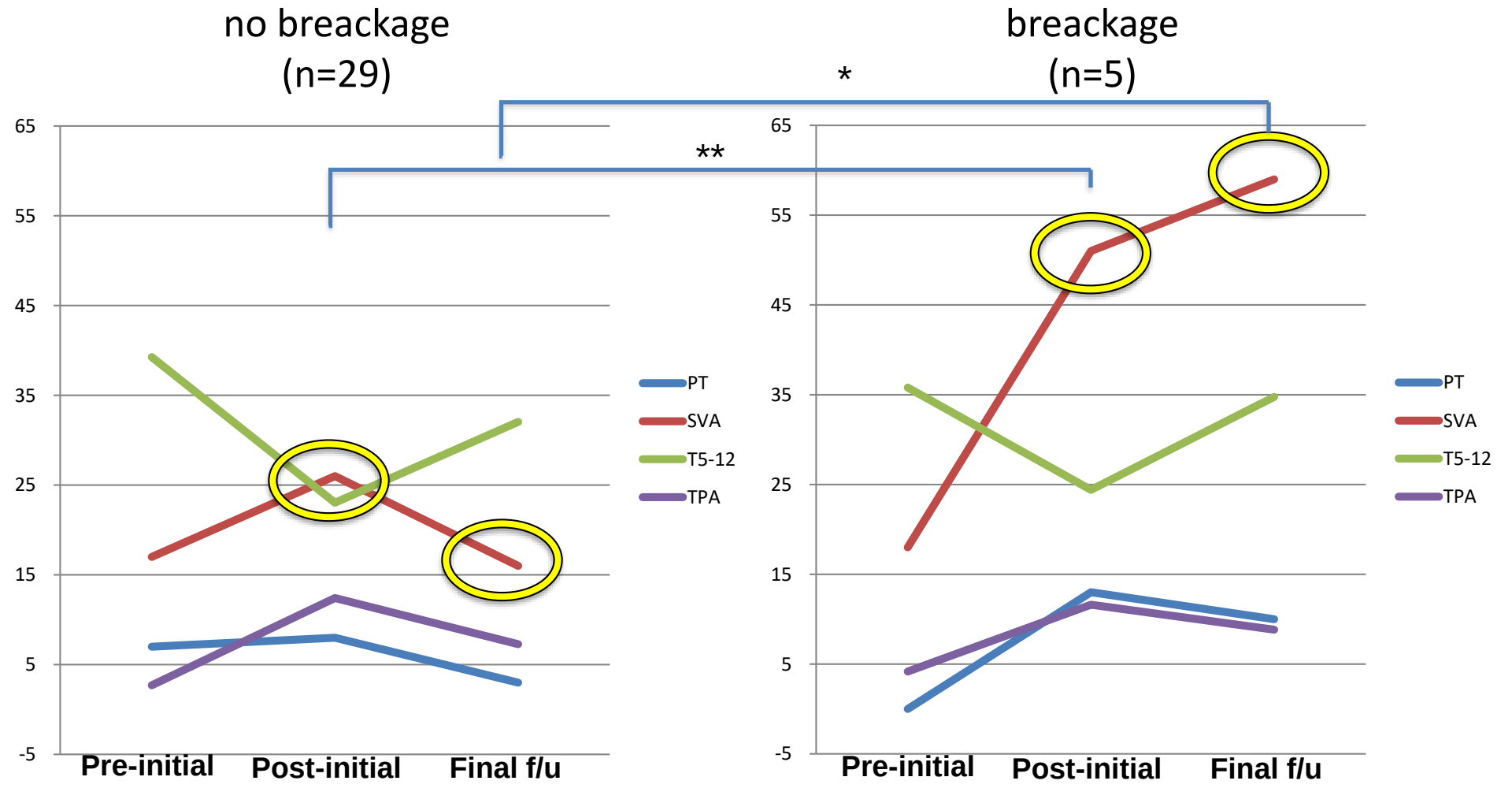
* p<0.01

Result: Rod breakage

pre-initial	**breakage (-) (n=29)**	**breakage (n=5)**	
PI	45	43	NS
PT	7	0	NS
SS	38	42	NS
SVA	17	18	NS
TK	39	36	NS
LL	53	54	NS
TPA	3	4	NS

post-initial	**breakage (-) (n=29)**	**breakage (n=5)**	
PI	45	46	NS
PT	8	13	NS
SS	37	32	NS
SVA	26	51	p<0.05
TK	23	24	NS
LL	45	38	NS
TPA	12	12	NS

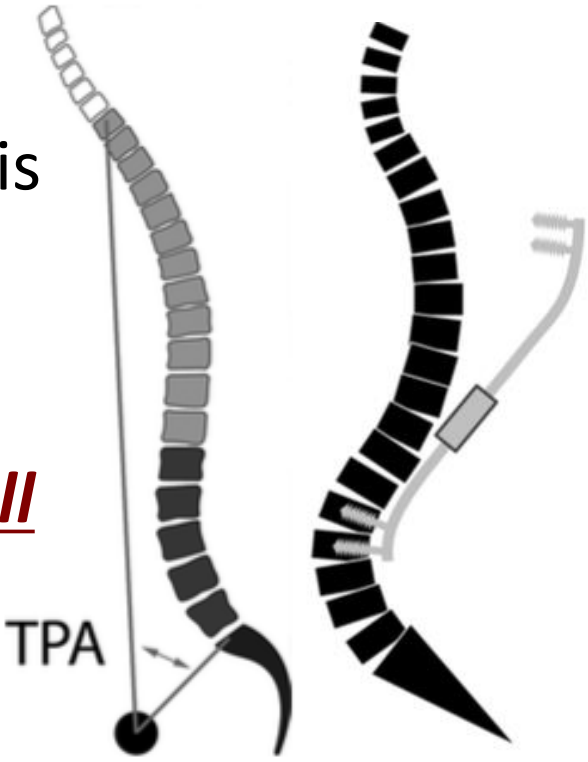
Result: Rod breakage



* p<0.01
** p<0.05

Discussion: Anchor dislodgement

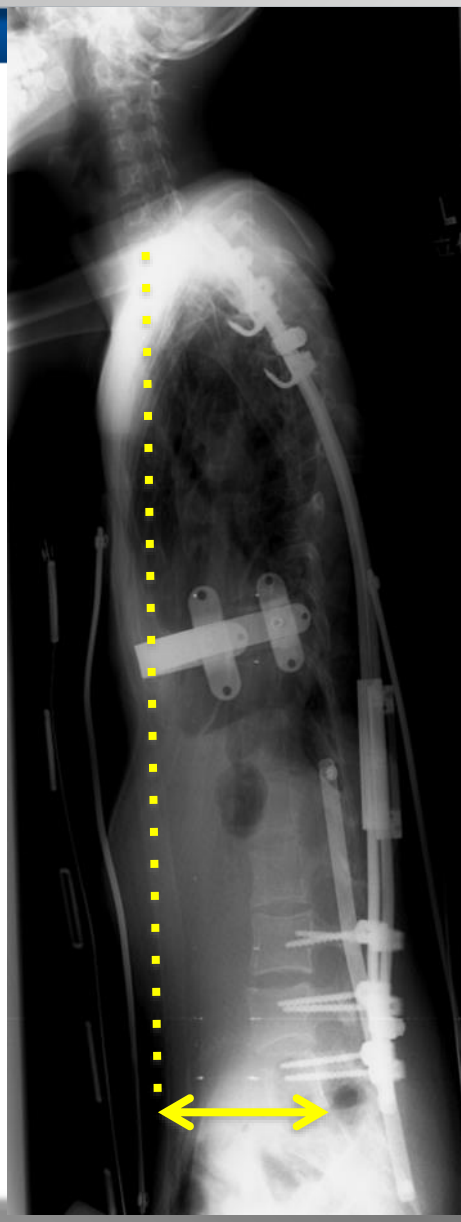
- ***TPA of pre-initial surgery*** was the only parameter related to anchor dislodgement.
- Large TPA indicate whole spinal kyphosis and it may increase pull out force for each anchor.
- ***<u>However, 6 degrees of TPA is very small and it is unclear whether it makes sense or not.</u>***



Discussion: Rod breakage

- *No parameter was shown as prediction item* for rod breakage at *pre-initial surgery*.

- ***Larger SVA at post-initial surgery is the only risk factor of rod breakage*** and it may be related with weakness of back muscle or disorder of maintain standing posture.



Conclusion

- Careful follow up is necessary if larger TPA at pre-initial surgery and larger SVA at post-initial surgery are seen in TGR for EOS.

- These complications are considered as multifactorial and further investigation is needed.

References

1. CHEN, Z. et al. How Does Hyperkyphotic Early-Onset Scoliosis Respond to Growing Rod Treatment? **J Pediatr Orthop**, Nov 2016.

1. EL-HAWARY, R. et al. What is the Risk of Developing Proximal Junctional Kyphosis During Growth Friendly Treatments for Early-onset Scoliosis? **J Pediatr Orthop,** v. 37, n. 2, p. 86-91, Mar 2017.

1. YANG, J. S. et al. Growing rod fractures: risk factors and opportunities for prevention. **Spine (Phila Pa 1976),** v. 36, n. 20, p. 1639-44, Sep 2011.

1. SCHROERLUCKE, S. R. et al. How does thoracic kyphosis affect patient outcomes in growing rod surgery? **Spine (Phila Pa 1976),** v. 37, n. 15, p. 1303-9, Jul 2012.

1. SHAH, S. A. et al. The effect of serial growing rod lengthening on the sagittal profile and pelvic parameters in early-onset scoliosis. **Spine (Phila Pa 1976),** v. 39, n. 22, p. E1311-7, Oct 2014.

1. WATANABE, K. et al. Risk factors for complications associated with growing-rod surgery for early-onset scoliosis. **Spine (Phila Pa 1976),** v. 38, n. 8, p. E464-8, Apr 2013.