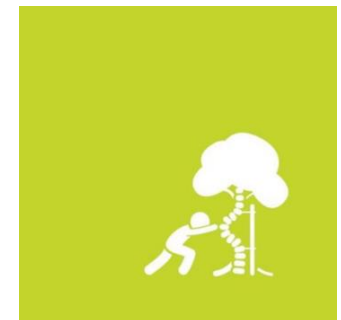


Radiographic outcome and complication rate of 34 graduates from treatment with vertical expandable prosthetic titanium rib – a single centre report

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Conflict of Interest Disclosure

- Daniel Studer no conflict of interest
- Philippe Büchler no conflict of interest
- Carol Hasler Consultant DePuy Synthes

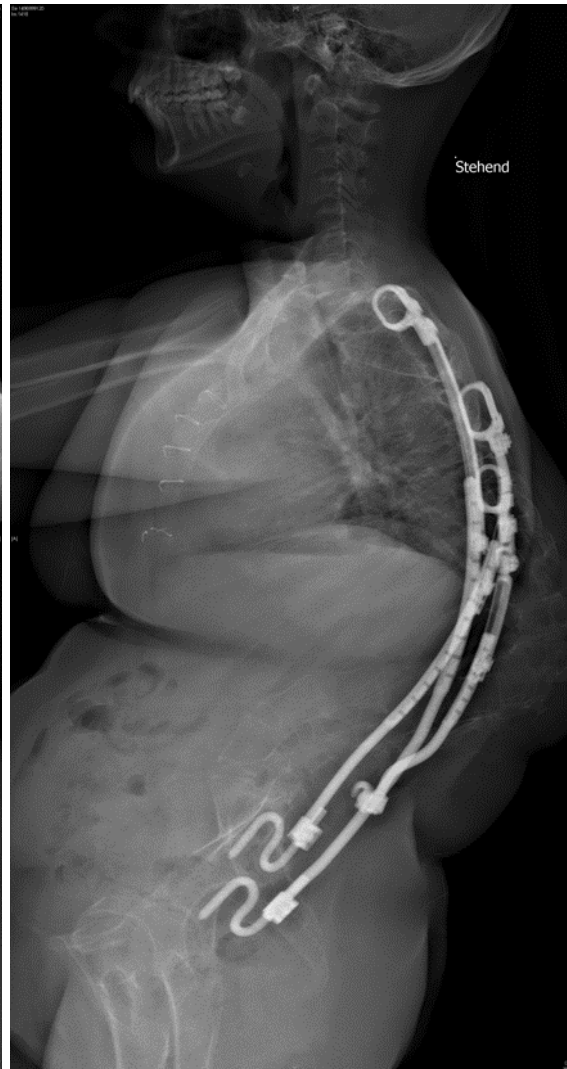
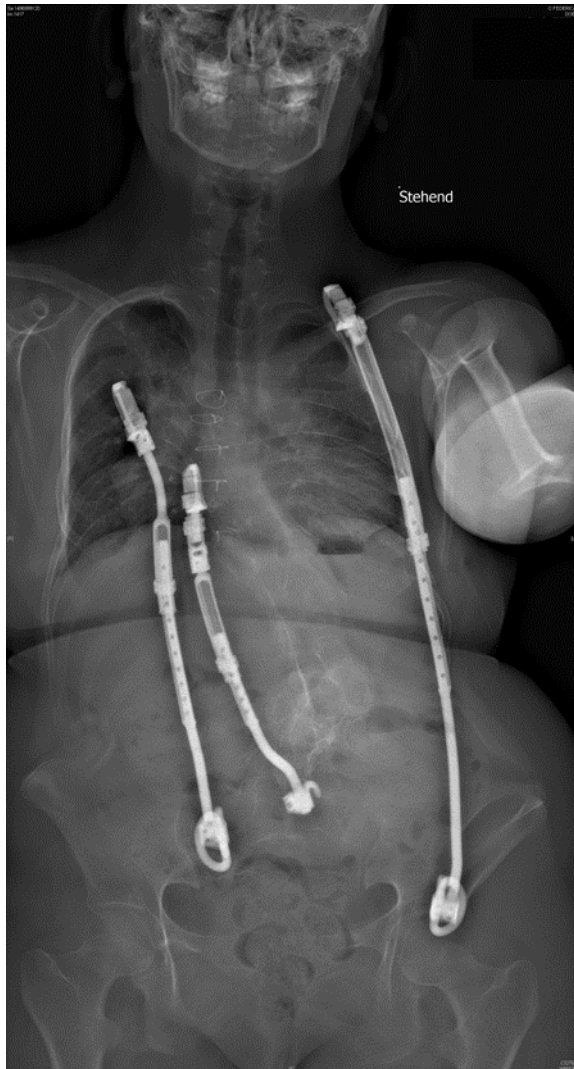
Background

«The heritage of enthusiasm for titanium rib prosthesis»



- congenital EOS / TIS
- widen the spectrum of indications
- indirectly control spinal deformities

Retrospective analysis of the treatment strategy and outcome for graduates from growth-friendly sparing surgery with titanium rib prosthesis



Methods

- IRB approval
- Database screened for EOS patients who have completed growth-friendly treatment with titanium rib prosthesis

«Final» treatment

fusion

non-fusion

r/o implant w/ PISF

r/o
implant

implant in
situ

w/ halo-gravity
traction

w/o halo-
gravity
traction

Methods

- Radiographic parameters
 - main coronal and sagittal plane deformity
 - pre/ post index surgery
 - at the end of lengthening
 - after final fusion (if applicable)
 - at latest f/u

- Complications
 - in case of final fusion surgery

Results

55 patients
treated with
titanium rib
prosthesis

- 11 under ongoing treatment
- 5/11 converted to MCGR



44 patients

- 10 incomplete medical records
- 3 died
- 6 further treatment abroad
- 1 salvage procedure



**34
graduates**

Results

treatment at the end of lengthening

- **5/34 (15%)**



- **r/o implant w/o final spondylodesis**

mean f/u 39 months

[all congenital]

82% congenital EOS

- **12/34 (35%)**



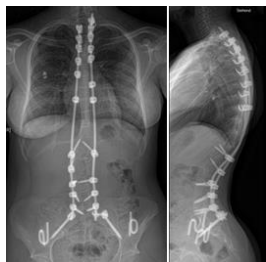
- **implant in situ**

mean f/u 43 months

[2 patients w/ recommendation for final fusion inoperable due to comorbidities]

[9 congenital, 3 neuromuscular]

- **17/34 (50%)**



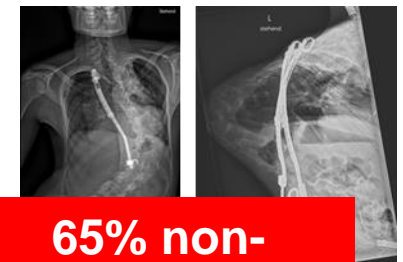
- **r/o implant w/ final spondylodesis**

mean f/u 25 months

age @ final fusion 14.6y

[8/17 w/ preop Halo-Gravity Traction]

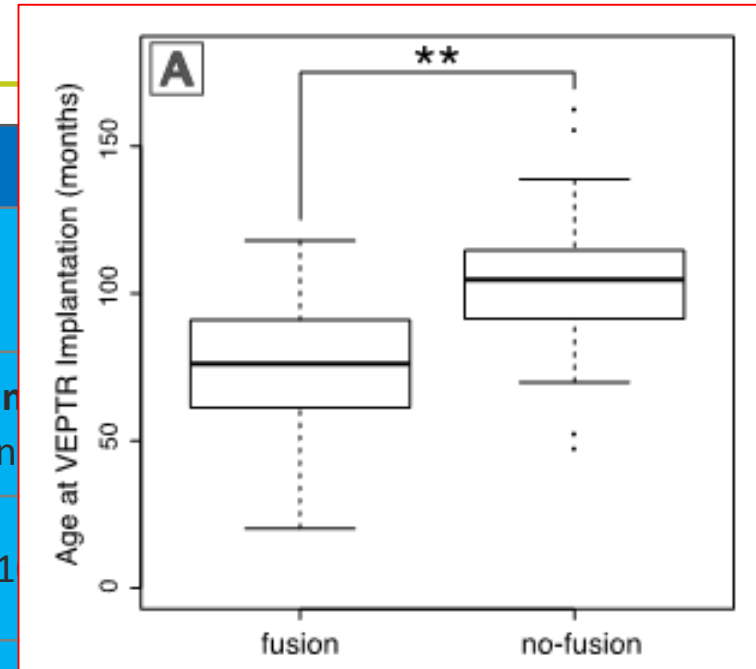
[6 congenital EOS, 6 neuromuscular, 4 syndromic, 1 idiopathic]



65% non-congenital EOS

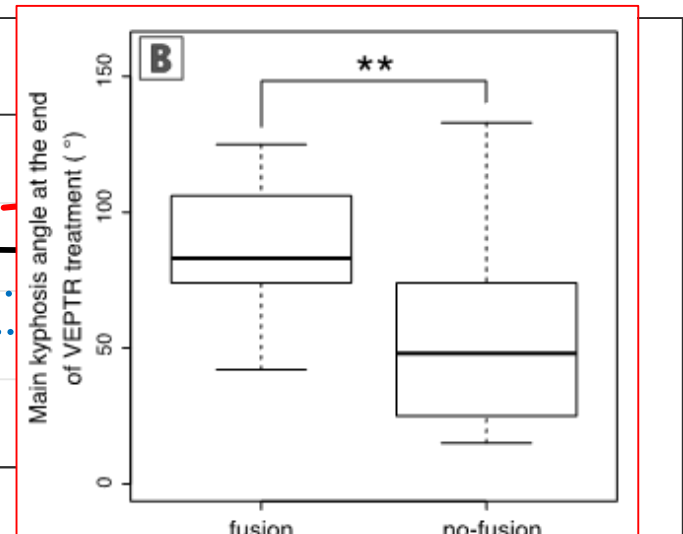
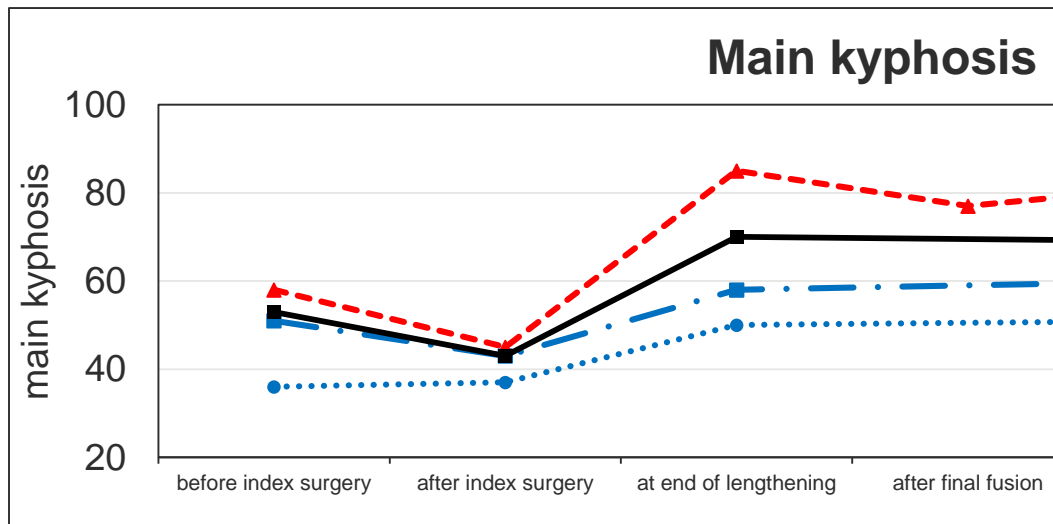
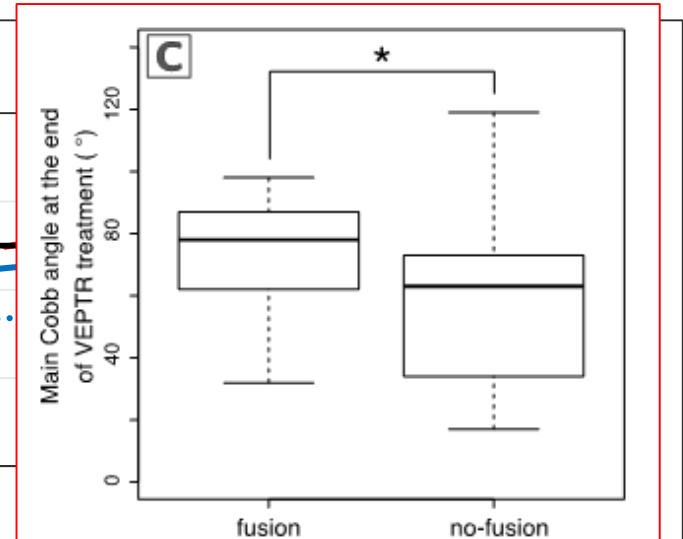
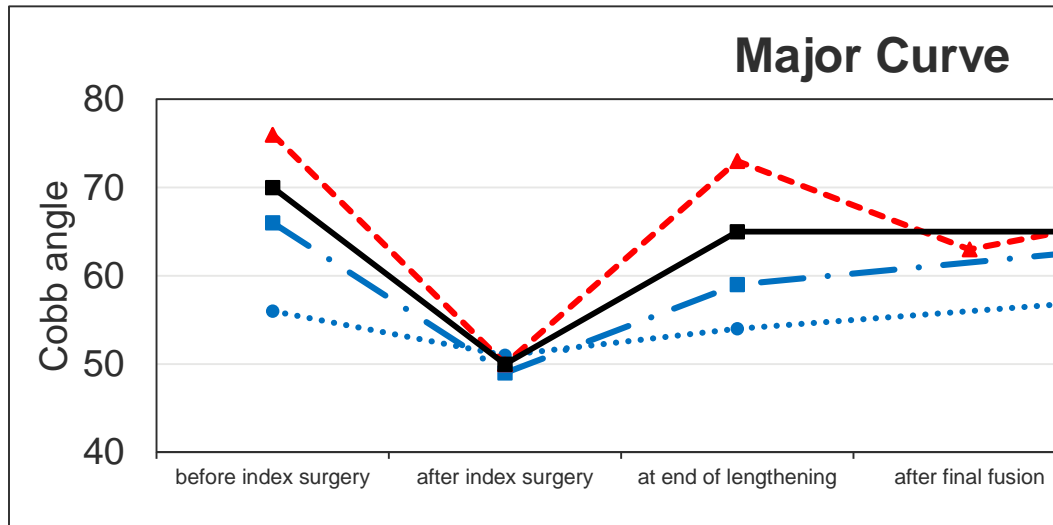
Results

	fusion	r/o in (n)		
n	17	5.5	6.5	6.7
avg Age at implantation (years)	6.0	1		
avg Duration of treatment (years)	7.0	5.5	6.5	6.7
avg Number of lengthenings	11	9	10	10
Aetiology				
- Congenital	6	5	9	20
- Neuromuscular	6	0	3	9
- Syndromic	4	0	0	4
- idiopathic	1	0	0	1



Results

Evolution of the deformity

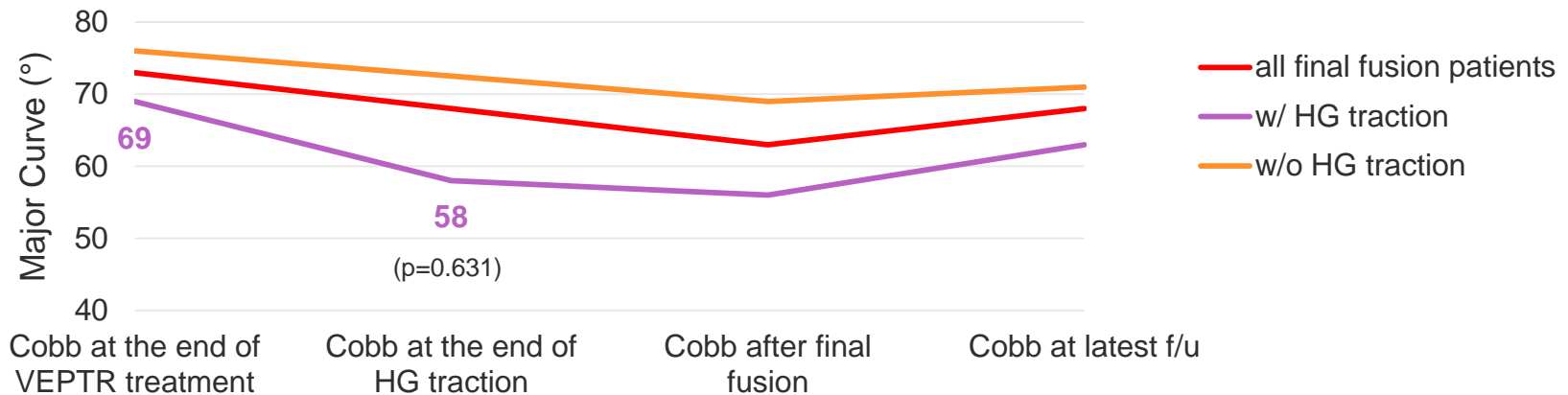


Results

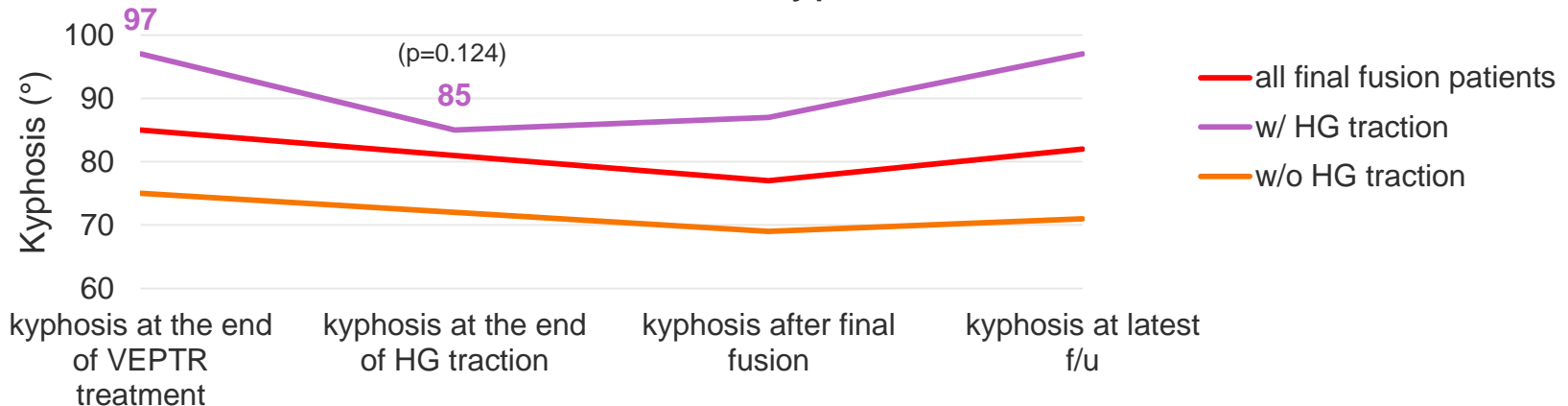
Preop halo-gravity traction (8/17)

[27 ± 11 days, range, 14-43 days]

Major Curve



Main kyphosis



Results / Discussion

Complications after «final» fusion

- **7/17 (41% complication rate)**
 - 2x SSI
 - 2x PJK
 - 1x loss of sagittal balance
 - 1x disfunction of ventriculo-peritoneal shunt system
 - 1x superficial wound healing
- 6 unplanned returns to the OR
 - **35% re-operation rate!**

Sawyer et al._Spine Deformity_2016

- n=37 (32 w/ rib-based fixation); 25 PSF
- complications: 15/25 (60%)
- re-operation rate: 24%

Poe-Kochert et al._JBJS_2016

- n=100 (tGR; min. 2-y f/u after final fusion)
- complications: 20/100 (20%)
- 57 unplanned returns to the OR in 20 patients

Results / Discussion

Correction with final fusion

Flynn et al. _J Bone Joint Surg Am_ 2013

Growing-Rod Graduates: Lessons Learned from Ninety-nine Patients Who Completed Lengthening

- percent of correction after final fusion
 - ≤ 20% in 18% **65%**
 - 21-50% in 48% **35%**
 - > 50% in 15% **0%**

- spine flexibility @ final fusion
 - 19% mobile
 - 19% decreased flexibility
 - **62% completely stiff**

Sawyer et al. _Spine Deformity_ 2016

Complications and Radiographic Outcomes of Posterior Spinal Fusion and Observation in Patients Who Have Undergone Distraction-Based Treatment for Early Onset Scoliosis

«...no significant curve correction or gains in spine height and length with PSF...»

Lattig et al. _Clin Spine Surg_ 2016

Treatment of Early-Onset Spinal Deformity (EOSD) With VEPTR

A Challenge for the Final Correction Spondylodesis—A Case Series

«...high degree of rigidity...»
 «...spontaneous autofusion...»
 «...final fusion longer than intended...»

J Child Orthop (2014) 8:237–244
DOI 10.1007/s11832-014-0585-0

ORIGINAL CLINICAL ARTICLE

Extraspinal ossifications after implantation of vertical expandable prosthetic titanium ribs (VEPTRs)

Vanja Zivkovic · Philippe Büchler ·
Dror Ovadia · Rolf Riise · Ralf Stuecker ·
Carol Hasler



Conclusion

- High complication rate during treatment with titanium rib prosthesis and with final fusion surgery
- high re-operation rate [«final» fusion \neq last surgery]
- Stiff spine and thorax allowing for little correction with final fusion
- Reluctant use of halo-gravity traction
- **Adapt expectations** [patient/family & surgeon] **at the beginning of growth-sparing surgical treatment**

Thank you for your attention

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