Global Alignment and Proportion (GAP) Score Predicts Mechanical Failure in Adult Spinal Deformity Surgery

Caglar Yilgor
Nuray Sogunmez
Louis Boissiere
Gökçe Keskin
Ferran Pellisé
Francisco Javier Sanchez Perez-Grueso

Emre R. Acaroglu
Ibrahim Obeid
Frank Kleinstück
Ahmet Alanay

ESSG European Spine Study Group
Background

• Ideal sagittal parameters for ASD patients
  – PI-LL within 10°
  – SVA <4cm
  – PT <20°

• These parameters may be misleading
  – as they are linear
  – and ignore pelvic anteversion and negative balance as potential failure causes
Aim

• Develop a scoring system
• based on global alignment
• and proportionate spine shape
• to predict mechanical failure
• in ASD surgery
Materials & Methods

• Study Design:
Retrospective analysis of
– Multicenter, prospective, consecutive patient series

• Inclusion criteria were
– posterior fusion >4 levels
– UIV>L2
– min 2y follow-up
Materials & Methods

- 183 patients
- Mean age
  - 51 (18-84)
- 141 F and 42 M
- Mean follow-up
  - 26 months (24-50)
Materials & Methods

• GAP Score
  – Pelvic version index (SS/PI)
  – Ideal lordosis index (LL/ideal LL)
  – Lordosis shape index (L4-S1 Lordosis/LL)
  – Global tilt

• GAP Score subcategories
  – Proportioned
  – Moderate disproportioned
  – Severe disproportioned
Materials & Methods

• GAP Score
  – Optimal cut-off points for each criteria were determined dividing each category into aligned and 3 disproportioned subgroups
  – Odds ratios were calculated for each subgroup
  – Scores were determined by stratification of odds ratios
  – GAP was calculated summing up scores
Materials & Methods

• GAP Score
  – Calculated in early post-op x-rays

• Complications recorded
  – Pseudoarthrosis
  – PJK
  – DJK
  – Implant related complications
  – Revision rates
Results

• Mechanical failure
  – 78 patients (42.6%)

• Revision due to mechanical complication
  – 41 patients (22.4%)
Results

• Mechanical Failures
  – Proportioned  5.9 %
  – Moderate disproportioned  39.3 %
  – Severe disproportioned  88.6 %

• Mechanical Revisions
  – Proportioned  2.4 %
  – Moderate disproportioned  21.4 %
  – Severe disproportioned  47.1 %

• GAP categories had
  – 93% prediction rate of mechanical failure
  – using ROC Curves (AUC=0.926, p<0.001, CI=95%)
Conclusions

• GAP score
  – formed by PI-based proportionate spine shape analysis and global alignment
  – precisely predicts mechanical failure
  – after ASD surgery

  – Setting sagittal plane surgical goals according to GAP will help preventing mechanical failure
## Disclosures

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<td>Yilgor C, Sogunmez N</td>
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<td>Boissiere L, Keskin G</td>
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