

8. MIS deformity correction using disruptive, AI-driven, augmented reality technology: Early clinical experiences

Philipp Kobbe, MD, PhD

Dept. Spine & Pelvic Surgery, University Hospital Aachen, Aachen, Germany

Background

In daily practice, the philosophy of wanting to transfer as little stress as possible to the screw-bone interface contrasts with the goal of wanting to achieve a perfect sagittal alignment, for instance in semirigid deformities. But even in cases where heavy metal is required, augmented reality technology like ADVISETM can significantly improve the outcome.

Case 1

Anamnesis: 59 year old male, severe back pain, walking distance < 500m, slight hyperlordosis thoracolumbar junction, Global Alignment and Proportion (GAP) score = 3
Surgical goal: restoration of disc T12-L1
Treatment: XALIF & OLIF with posterior instrumentation T10 to ilium, rod bending using ADVISETM: precise shape of a long rod
Outcome: proper correction achieved (GAP score = 0)

Case 2

Anamnesis: 59 year old female, severe hypolordosis, coronal dysbalance, GAP score = 7, stenosis, 3 prior surgeries: 2x compression, 1x fusion without graft L4-L5
Surgical goal: re-balancing
Treatment: ALIF & OLIF with posterior instrumentation L2-S1, rod bending using ADVISETM: precise rod shape, no force needed for final tightening of set screws
Outcome: improved balance (GAP score = 2)

Case 3

Anamnesis: 76 year old male, severe hypolordosis, degenerative lumbar scoliosis, GAP score = 12
Surgical goal: re-balancing
Treatment: 3x OLIF & 1x XLIF with posterior instrumentation L1-L5, rod bending using ADVISETM: precise rod shape
Outcome: improved balance (GAP score = 2)



Case 3, Pre-op



Case 3, Post-op

Case 4

Anamnesis: 65 year old male, moderate hypolordosis, degenerative lumbar scoliosis, GAP score = 9

Surgical goal: re-balancing

Treatment: ALIF with posterior instrumentation L1-S1, rod bending using ADVISE™: precise rod shape

Outcome: improved balance, slight overdistraction causes less correction of scoliosis (GAP score = 1)

Clinical results so far...

21 patients treated with MIS deformity correction using ADVISE™ software, average follow-up 4 months (1 to 7 months), mean length of hospital stay 5.5 days, no proximal junctional kyphosis or failure. Experience to date suggests that the use of AR software in long posterior percutaneous instrumentation results in intraoperative time savings, reduces radiation exposure, decreases postoperative pain, and allows earlier mobilization.

Next steps

ADVISE™ is, at the moment, a screw-based measurement. However, when merged with intraoperative imaging, this self-learning platform can generate large amounts of data. This could allow real-time intraoperative tracking of spinal correction and enable the surgeon to "bring preoperative planning to the table" by monitoring the achieved correction step by step.