UNID™ ASI: How artificial intelligence is shaping the future of spine surgery – a surgeon's perspective

Presented by:
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Dr. Daniels is a paid consultant for Medtronic.

Dr. Alan Daniels has performed more than 370 procedures using UNiD™ Adaptive Spine Intelligence – a revolutionary longitudinal data collection platform. Leveraging artificial intelligence and predictive modelling, UNiD™ ASI can support surgeon planning, execution using patient-specific rods, and postoperative analysis of the patient's alignment over time. The platform's patient-specific rods are FDA cleared for use with the CD Horizon™ Solera™, CD Horizon™ ModuLeX™ 5.5/6.0, and Infinity™ OCT spinal systems.

In this article, Dr. Daniels will share his insights on the role of AI and predictive modeling in shaping the future of spine surgery.

What are the benefits of UNID™ ASI in your spine practice?

To me, using this platform for case planning, execution, postop monitoring, and evaluating spinal alignment is indispensable. It assists me in every phase of my patients' care from pre-op to post-op.

Are you using UNID™ ASI platform for all your cases today?

In my practice, we use UNiD™ ASI to plan all posterior spinal fusions. Spinal alignment is critical to long-term outcomes – and I'm not just talking about spinal deformity! Planning degenerative and deformity conditions are equally important in my practice.

Studies show **lordosis matters in degen patients**. Scan the code to learn more.

Specifically in short constructs, where do you see the value of preoperative planning and data collection?

Proper alignment in short constructs helps me restore sagittal alignment, which can protect the spine from ongoing degeneration. The data collection aspect of the platform is essential for the AI models to learn and continuously improve.

How do you think data and AI in general will impact the future of spine surgery?

Data and AI will help us perform smarter, better informed surgery optimizing outcomes for patients. Surgeon and patient specific AI models will eventually be utilized for even more accurate prediction of alignment and outcomes.

UNiD™ ASI 7-step iterative workflow

UNiD™ ASI leverages the aggregation of all UNiD™ procedures via a proprietary 7-step process that creates an iterative virtuous cycle. Through the power of data collection and machine learning, a unique capability is created, allowing for a cycle of improvement.

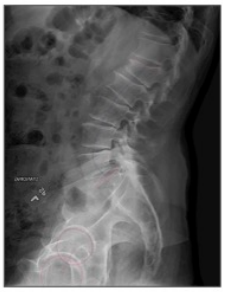
The UNiD™ cycle begins for each patient with the rapid identification of spinopelvic parameters using calibrated x-rays. Integration with PACS and communication via the UNiD™ HUB support the goal of improved patient workflows.

Case study

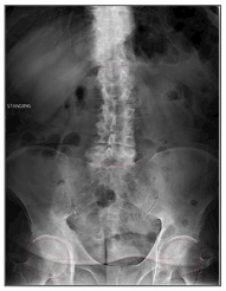
The case presented here demonstrates how Dr. Daniels uses UNID™ASI technology in his practice.

History and examination

A 66-year-old male presented with back and predominate severe leg pain. Severe foraminal stenosis was diagnosed on MRI at L4/L5 and L5/S1. The patient was an excellent candidate for indirect decompression via an ALIF procedure.



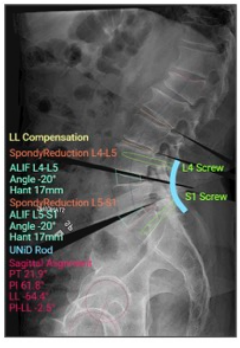
Sagittal pre-operative imaging



AP pre-operative imaging

Case simulation

The UNiD™ LAB engineer uses proprietary software platform to simulate multiple surgical strategies based on a combination of the surgeon's input and preferences, as well as scientific literature. Each simulation is processed through proprietary predictive models allowing the surgeon to visualize the postoperative compensatory mechanisms most likely to occur.



UNiD™ HUB plan

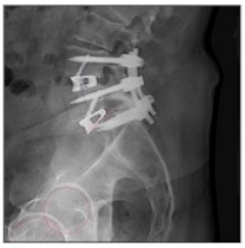
Surgical plan

The primary goal of this procedure was to achieve the following:

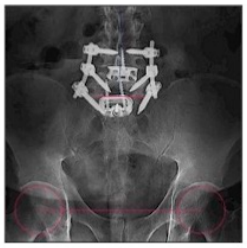
- Restore lordosis to the lumbar spine
- Decompress the spine anteriorly to achieve 35° of lordosis from L4-S1
- Provide stability using UNID™ ASI patient-specific rods and posterior instrumentation from L4-S1

Procedure

The patient underwent an ALIF procedure followed by percutaneous robotic-guided screw fixation.



Sagittal post-operative imaging



AP post-operative imaging

Outcomes

Patient had immediate resolution of pain and was discharged one day after surgery.

Data collection

This process combines data collection, advanced analytics, and visualization within the UNiD™ HUB.

Surgical cases are organized and easily accessed. Multiple output options are available for use in presentations, reports, clinical studies.

and UNiD™ HUB alignment parameters

Interested in learning more about UNiD™ ASI? Visit Medtronic.com/UNiD to request a demo.

UNiD™ spine analyzer

The UNiD™ spine analyzer is intended for assisting healthcare professionals in viewing and measuring images as well as planning orthopedic surgeries. The device allows surgeons and service providers to perform generic, as well as spine related measurements on images, and to plan surgical procedures. The device also includes tools for measuring anatomical components for placement of surgical implants. Clinical judgment and experience are required to properly use the software.

The PASS LP™ spinal system is a pedicle screw fixation system intended for immobilization and stabilization of spinal segments in skeletally mature patients as an adjunct to fusion in the treatment of the following acute and chronic instabilities or deformities of the thoracic, lumbar, and sacral spine: degenerative disc disease (defined as discogenic back pain with degeneration of the disc confirmed by history and radiographic studies), spondylolisthesis, trauma (e.g., fracture or dislocation), deformity or curvature (e.g., scoliosis, kyphosis, and/or lordosis), tumor, spinal stenosis, pseudarthrosis, or failed previous fusion.

Except for rod plates and caps for sacral plates, when used for posterior non-cervical pedicle screw fixation in pediatric patients, the PASS LP™ spinal system implants are indicated as an adjunct to fusion to treat adolescent idiopathic scoliosis.

Additionally, the system is intended to treat pediatric patients diagnosed with the following conditions: spondylolisthesis/ spondylolysis and fracture caused by tumor and/or trauma. The PASS LP™ spinal system is intended to be used with autograft and/or allograft. Pediatric pedicle screw fixation is limited to a posterior approach.

The Sovereign™ spinal system is indicated for use with autogenous bone and/or allograft bone graft comprised of cancellous and/or corticocancellous bone graft, and/or demineralized allograft bone with bone marrow aspirate in patients with degenerative disc disease (DDD) at one or two contiguous levels from L2 to S1. DDD is defined as discogenic back pain with degeneration of the disc confirmed by history and radiographic studies. Additionally, the Sovereign™ spinal system is indicated for use in patients diagnosed with multilevel degenerative scoliosis and sagittal deformity conditions as an adjunct to fusion. These patients should be skeletally mature and have had 6 months of non-operative treatment. When used in patients as an adjunct to fusion in patients diagnosed with multilevel degenerative scoliosis and sagittal deformity conditions, additional supplemental fixation (e.g., posterior fixation) must be used. These implants may be implanted via a variety of open or minimally invasive approaches. These approaches include anterior and oblique.

The Sovereign™ spinal system may be used as a stand-alone device or in conjunction with supplemental fixation. When used as a stand-alone device, the Sovereign™ spinal system is intended to be used with 3 titanium alloy fixed or variable angle screws. The accompanying cover plate MUST be used anytime the device is used with any number of variable angle screws. If the physician chooses to use less than 3 or none of the provided screws, additional supplemental fixation in the lumbar spine must be used to augment stability. Implants with lordosis angles >18° are intended to be used with supplemental fixation (e.g., facet screws or posterior fixation).

Potential adverse events

All of the possible adverse events associated with spinal fusion surgery without instrumentation are possible. With instrumentation, a listing of potential adverse events includes:

- Early or late loosening of any or all of the components.
- Disassembly, bending, or breakage of any or all of the components.
- Post-operative change in spinal curvature, loss of correction, height, or reduction.
- Infection

For instruments and implant-specific indications, contraindications, warnings, precautions, and other important medical information, please see the package inserts for the respective product(s). An electronic version of the package insert may be found at **https://bit.ly/3uPauYK.**

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