Figure 4. Case 4: The PathFinder system also can be used to supplement multi-level anterior lumbar interbody fusions (ALIF). Post-operative plain films after L4-5 and L5-S1 mini-ALIF using radiolucent cages supplemented with multi-level PathFinder instrumentation.

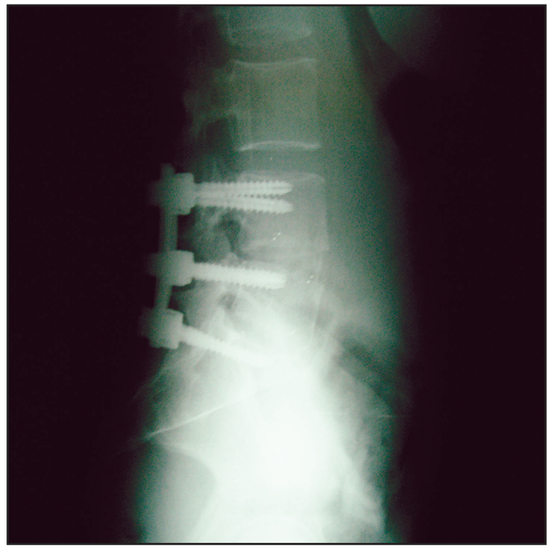

Figure 4

Conclusion

In all of these cases the patients have had excellent outcomes and have returned to active lifestyles without debilitating back pain. Although there are many more cases that could be illustrated, these cases show the versatility of the Pathfinder system in treating spinal conditions with the key goal of maintaining normal anatomical integrity of the spine while achieving spinal instrumentation.

Versatility: PathFinder® Minimally Invasive Spine Instrumentation System

Mick Perez-Cruet, MD, MS

Minimally invasive spine (MIS) surgery is rapidly becoming the treatment of choice for a variety of spinal disorders including the treatment of herniated discs, spinal stenosis, and chronic debilitating back pain. Recent developments in technique and instrumentation allow for the preservation of normal anatomical structures when performing spinal fusion and instrumentation. These advances help to preserve structures of the spine (i.e., muscles, ligaments, and bone) that are critical to long-term spinal function and improved patient outcomes. Additionally, by using MIS techniques, neural innervation and vascular supply to the para-spinal musculature and facet joints is preserved, potentially reducing adjacent segment disease in patients undergoing spinal fusion and instrumentation. The goal of MIS is centered on developing treatments for patients suffering from spinal disorders that are less painful, more cost effective and lasting. The result is an improved quality of life and return to activities of daily living sooner for patients. The PathFinder (Abbott Spine, Austin, TX) minimally invasive spinal instrumentation system was developed with this goal in mind. The design is unique, simple, and extremely versatile as illustrated below.

The PathFinder system was developed by surgeons to allow for percutaneous placement of pedicle screws using fluoroscopic guidance. Similar in technique to other minimally invasive procedures, the pedicles are cannulated using a targeting needle. A k-wire is passed through the pedicle over which a tap and a pedicle screw are subsequently placed. The rod is then passed down a slotted extender sleeve that attaches securely to the screw heads. Reduction and compression can then be performed. Unlike more traditional pedicle screw systems, the bony anatomy of the spine does not need to be exposed. This maintains the muscular and ligamentous attachments to the spine.The PathFinder system represents the first MIS instrumentation system capable of spinal reduction, graft compression, segmental distraction, and multi-segmental instrumentation through two small para-spinal skin incisions**.** Maintenance of normal anatomical integrity will ideally lead to better fusion rates, as well as a reduced incidence of adjacent segment disease. The outcome of this could be returning patients to work or activities of daily living sooner. The following cases illustrate the versatility of the PathFinder system in achieving minimally invasive spinal instrumentation and improved patient outcomes.

Case 1:

A 76-year-old female with mild osteoporosis, grade I spondylolisthesis, and stenosis presented with intractable back pain and neurogenic claudication **(Figure 1)**. With the patient in the prone position on a radiolucent Wilson frame, the spine was approached with a series of muscle dilators over which a tubular retractor was placed. Through the tubular retractor, a microendoscopic laminectomy for decompression was performed. Interbody graft placement was achieved via a transforaminal lumbar interbody fusion (TLIF) from a unilateral approach maintaining the contralateral facet complex. After graft placement, percutaneous pedicle screws were placed using the PathFinder system. With the screws in place, reduction of the spondylolisthesis was performed allowing for restoration of sagittal alignment **(Figure 1)**. Post-operative computed axial tomography (CT) shows adequate decompression of the canal with instrumentation in place. This technique can similarly be performed on patients with higher-grade spondylolisthesis as illustrated in case 2 **(Figure 2)**.

Figure 1. Pre-operative (A.) axial and (B.) sagittal MRI images of patient with grade I spondylolisthesis and stenosis.

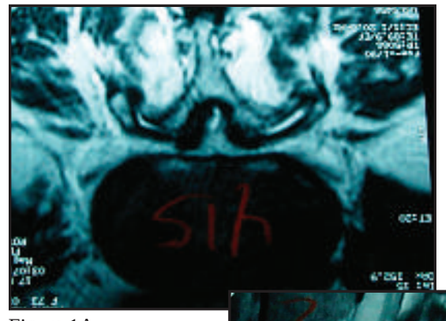

Figure 1A

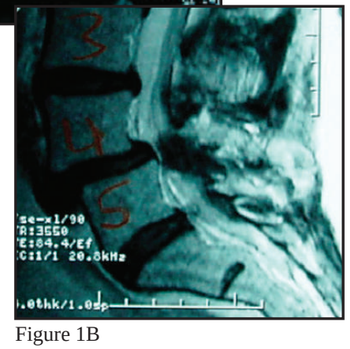

Figure 1B

Intra-operative fluoroscopic views (C.) before and (D.) after reduction using the PathFinder system to restore sagittal alignment. Post-operative axial (E.) CT showing decompression with instrumentation in place. Post-operatively the patient soon returned to her normal daily activities.

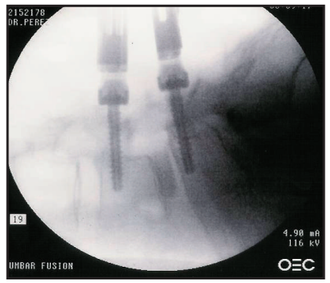

Figure 1C

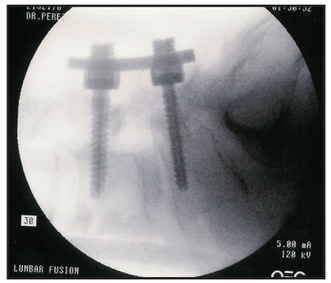

Figure 1D

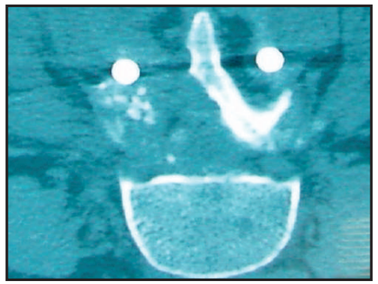

Figure 1E

Case 2:

Figure 2. (A.) Pre-operative sagittal MRI and **(B.)** plain films showing grade 2 spondylolisthesis. Post-operative reduction, instrumentation and fusion **(C.)** plain films and **(D.)** sagittal CT reconstruction showing reduction. **(E.)** Intra-operative and **(F.)** post-operative incision after PathFinder instrumentation. Post-operatively the patient returned back to work soon after surgery and was able to resume a normal lifestyle.

Figure 2A

Figure 2B

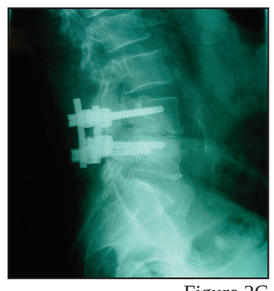

Figure 2C

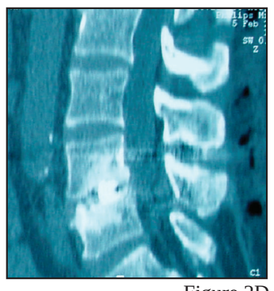

Figure 2D

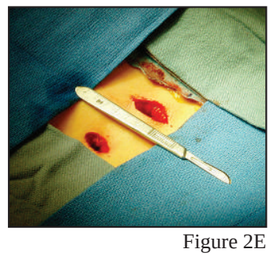

Figure 2E

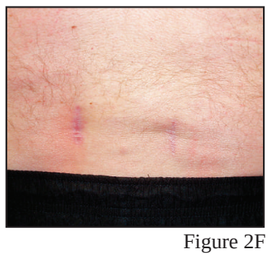

Figure 2F

Case 3:

A 55-year-old patient with Addision's disease on long term prednisone therapy presents with neurogenic claudication and debilitating back pain **(Figure 3)**. In this case a multi-level microendoscopic laminectomy for spinal stenosis was performed first with decompression of the neural elements from L3 to L5. After decompression a posterolateral fusion was performed bilaterally through the tubular retractor system from the transverse process of L3 to L5 bilaterally. Slight reduction was achieved, however aggressive attempts at reduction were avoided due to poor bone quality. A multi-level PathFinder instrumentation was then performed. This patient returned to work with minimal pain 3 weeks following surgery.

Figure 3. Pre-operative **(A.)** axial and **(B.)** sagittal MRI showing multi-level spondylolisthesis with concomitant spinal stenosis. Post-operative **(C.)** lateral and **(D.)** anteroposterior plain films with PathFinder instrumentation in place. Post-operatively the patient wore an external bone growth stimulator and returned to work 3 weeks after the surgery.

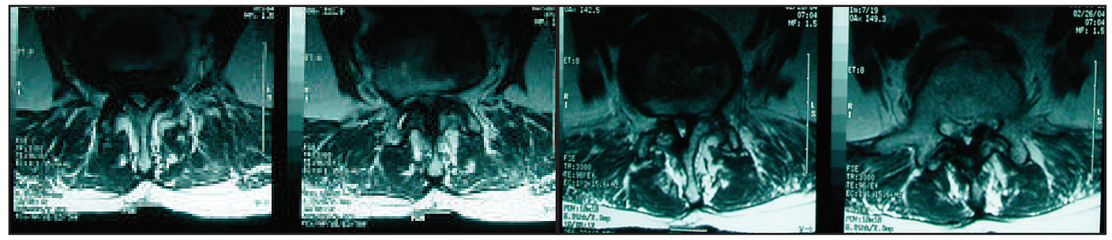

Figure 3A

Figure 3B

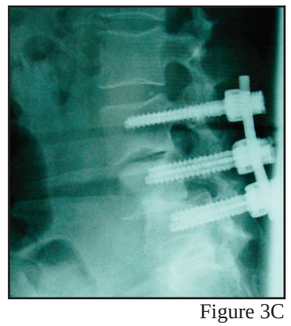

Figure 3C

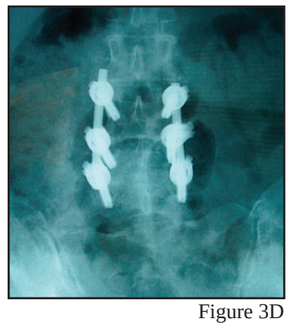

Figure 3D