The patient is a 21-year-old Caucasian female. She presented to the Neurosurgical Clinic last year with her coach. She is a volleyball player and had been suffering some significant low back pain particularly when playing sports. The patient reportedly has a long-standing history of axial low back pain, beginning at six years of age. The patient was an active athlete at ISU; however, her back pain has impeded her ability to continue participating in sports. ROS negative except for baseline low back pain with right lower extremity radiculopathy symptoms.

But the problem had progressed significantly so that now whenever she would stand or walk for any distances she ended up with a lot of back pain and bilateral leg pain. She was managed conservatively but in the long run had failed.

Neuro exam
- Strength 5/5 DF, PF, EHL, Hip Flex/Ex Bilaterally
- Sensory intact to light touch throughout
- Occasional Pain in the L5 Dermatome Right

Imaging
Taken to surgery for DLL, PLIF, PSF L5-S1

Post-op
- Her radicular pain in the right leg did not go away and was reported slightly worse than pre-op.
- She developed some tingling in her right leg.
- CT scan that suggested that the pedicle screw placed in the sacrum may have breached the wall next to the S1 nerve root, and because of that we elected to move our screw somewhat more laterally.
The patient was discharged home to Iowa a few days later, but after returning home, she had issues with pain management and was not able to urinate and defecate on her own easily. She then returned to BroMenn for reevaluation. MRI of the lumbar spine revealed a fluid collection and the patient was brought back to the operating room the following day for evacuation of the fluid collection and wound exploration.
Post-op Course
- The patient had an unremarkable hospital course afterward. She has been ambulatory. Pain has been controlled. She has been urinating and defecating on her own without problems.
- Right leg radiculopathy still present but improved

Discussion
Conjoined lumbosacral nerve roots: current aspects of diagnosis

Lumbar Root Anomalies
- Several different types of nerve root anomalies are relatively common in anatomical studies, but less common with imaging studies, which suggest they are under recognized clinically.
- These congenital anomalies may account for a portion of the poor results from lumbar disc surgery because the abnormal and unrecognized roots may be injured.
- This is of even more concern with some minimally invasive techniques with less direct nerve visualization.

Things to Consider
- These root anomalies can cause false-positive interpretations of imaging studies and can be confused with disc bulges or herniations. Particularly if the herniation appears in an atypical location, such as near the pedicle, or if the signal intensity is different from disc material, a diagnosis of a conjoined root should be considered.
- Also, if a patient presents with a history of failed back surgery, this diagnosis should be considered.
- The anomalous roots not only can be divided inadvertently, but also can be injured by excessive tension because the conjoined roots usually are less mobile than normal roots.
Type 1 occurs when two roots share a common sleeve that originates from the dura mater.

Type 1A anomalies have one cephalad root departing the conjoined stalk at an acute angle to exit below the appropriate pedicle, and the caudal root travels within the canal to exit also below the appropriate pedicle. If the cephalad root exits at 90 degrees from the conjoined portion, this is a type 1B anomaly.

Type 2 anomalies occur when two roots exit through a single foramen. Type 2A anomalies have one vacant foramen; type 2B anomalies have a portion of one of the roots exiting via the other foramen, which may be cephalad to the foramen occupied by the two nerve roots.

Type 3 anomalies occur when there is an anastomosing branch between two adjacent nerve roots. This branch crosses the disc space and can easily be injured during discectomy.
A second type of anomaly that may be as common as conjoined roots is a furcal nerve root; this refers to a bifurcation of a single nerve root. Often furcal roots are bilateral and can occur at multiple levels. Increased awareness of these anomalies is important to reduce the risk of nerve injury and to avoid surgery with an incorrect diagnosis of disc herniations.

Surgical outcomes in patients with conjoined roots tend to be significantly worse than in the general population.

So then what are the outcomes?

- Surgical treatment of 63 cases of conjoined nerve roots.
- White JG 3rd, Strait TA, Binkley JR, Hunter SE.
- Abstract
- The operative results of 63 cases of lumbar disc disease with surgically confirmed conjoined nerve roots are reviewed. The first 55 patients were treated by standard hemilaminectomy and discectomy, with only 30% reporting a good result. Of the last eight patients treated by hemilaminectomy, pediculectomy, and discectomy, seven patients returned to work. The rationale for and the technique of pediculectomy are discussed in detail.
- Clinical, radiological, and surgical clues indicating the presence of the conjoined nerve root anomaly are reviewed.

- Only one patient had a good result
- Two patients had a fair result
- One patient had a poor result

Nerve root anomalies are frequently underrecognized on advanced imaging studies and are also underappreciated and underreported when encountered surgically.

Twin dermatomal involvements, in addition to a negative Lasègue sign, are clues to the diagnosis of a probable conjoined nerve root anomaly.

Extension of routine hemilaminectomy to a facetectomy and partial pediculectomy leads to a favorable outcome.
Prevalence

- The prevalence of lumbosacral nerve root anomalies varies widely.
- In surgical studies, up to a 2% incidence has been reported.
- Myelography reports of patients with complaints of leg pain in the presence of a suspected disk herniation double the incidence of suspected nerve root anomalies (4%).
- Cadaveric anatomic studies have demonstrated a much higher incidence. (16%)
- Haijiao et al found a 17% incidence of nerve root anomalies following a review of 370 lumbar spine MRI scans.

Take Home Points

- The conjoined nerve root represents the most common nerve root anomaly.
- Unfortunately, the most common environment in which nerve abnormalities are diagnosed is the operating room, which dramatically increases the potential for an iatrogenic complication.
- Extension of routine hemilaminectomy to a facetectomy and partial pediculectomy leads to a favorable outcome.