

FLASH[™] Navigation with 7D Technology

CASE STUDY | SPINAL ANESTHESIA



Surgeon Profile

SURGEON

Ahmer Ghori, MD
Orthopedic Surgeon

LOCATION

Orthopedics North East and
Parkview Orthopedic Hospital
in Fort Wayne, IN, USA

Case Highlights

- 4 screws guided with 1 registration
- Registrations performed:
 - Average registration workflow time: 34.8s
 - Average FLASH Navigation processing time: 4.0s
 - Average points registered: 1,271

Introduction

With the changing economics of healthcare, there is an emphasis on less-invasive spine surgery in an ambulatory setting, reducing hospital stays, minimizing postoperative pain, immobility, and complications. In this case report, we present a 42 yo female with a 10-year history of progressive leg radiculopathy with mechanical back pain due to L4 spondylolysis and L4–L5 spondylolisthesis who underwent transforaminal lumbar interbody fusion (TLIF) under spinal anesthesia with the use of the FLASH[™] Navigation System with 7D Technology.

Clinical Presentation

The patient had a history of debilitating leg pain secondary to L4 radiculopathy. Physical therapy was performed, followed by a diagnostic transforaminal injection, which provided temporary relief of her symptoms. X-rays showed dynamic listhesis at L4–L5 along with L4 spondylolysis (Figure 1). MRI confirmed L4 nerve compression in the foraminal zone, concordant with this patient’s radiculopathy. Dr. Ghori recommended TLIF for the indication of dynamic spondylolisthesis with radiculopathy recalcitrant to non-operative management. However, this patient had a previous near-fatal pulmonary embolus after general anesthesia, as such she was hesitant to undergo surgery despite the severity of her symptoms. To minimize systemic health risk, Dr. Ghori recommended a less-invasive approach with a spinal anesthetic.



Figure 1. Preoperative x-ray of patient visualizing L4–L5 spondylolisthesis.

Surgical Procedure

The surgery was performed at Parkview Othopedic Hospital in Fort Wayne, IN using a 1.5 inch posterior midline incision with dissection to but not lateral to the L4–L5 facet joints and L4 pars-interarticularis. The L3–L4 joints were not exposed. Cortical screws were placed using the FLASH Navigation System into L4 and L5. These had been pre-planned on the system using a pre-operative CT scan, which allowed Dr. Ghori to minimize the incision and soft tissue disruption required for instrumentation. Bilateral L4–L5 complete facetectomies along with a Gill resection of the L4 lamina was performed to provide complete foraminal decompression and restore biomechanics at the affected segment. An expandable TLIF cage was used to distract across the disc space and build in lordosis. Final reduction was performed using reduction towers on the L4 screw, in order to reduce it up to the L5 screw. Final X-rays showed complete reduction of the listhesis.

Clinical Outcome

The patient was observed in the PACU until her spinal anesthesia wore off, and her neurologic exam was normal. She was able to demonstrate safe independent ambulation, bladder function, and was taken home by her husband. Postoperatively, she reported that her leg pain had resolved, and she was managing well on oral over-the-counter medications. Figure 4 shows the final placement of the screws and interbody device.

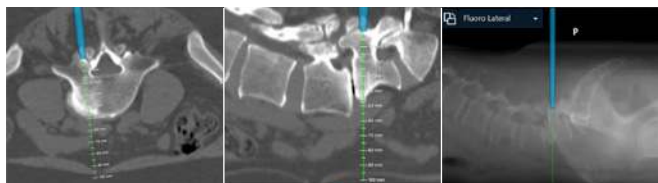


Figure 2. Initial trajectory and entry point determined with use of navigated probe, followed by use of navigated drill guide with use of the axial and sagittal views and the reconstructed sagittal fluoro view.

FLASH[®] Navigation System

Dr. Ghori used the FLASH Navigation System because it provided several advantages over other navigation platforms. The FLASH Navigation System has reduced intraoperative radiation exposure and the segmental registration feature allows for optimal accuracy for screw placement at every level (Figure 2). Time under anesthetic is minimized with an efficient registration process that takes approximately 30 seconds and captured over 1200 data points (Figure 3). This allowed Dr. Ghori to make a small incision and place screws accurately, resulting in less disruption of soft tissue. The efficient navigation workflow minimized operative time allowing the patient to have a spinal anesthetic, instead of requiring a general intubation.

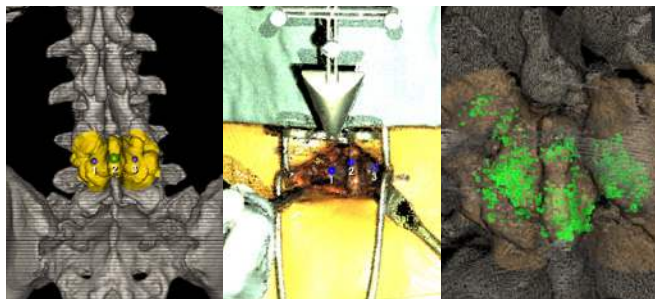


Figure 3. To initiate the workflow of FLASH Navigation, the preoperative CT is uploaded, and displayed on the FLASH Navigation System where 3 points were selected across L4 to initiate segmental registration. After the FLASH Navigation captures the topography and creates a 3D digitization of the patient, 3 matching points were selected across L4 to register these two images. In 4 seconds, a total of 1,271 data points were matched between the preoperative CT and the new FLASH image.



Figure 4. Postoperative x-ray displaying accurate placement of pedicle screws.

Pioneering Approach

Dr. Ghori was the first surgeon to perform an outpatient lumbar fusion with a patient under spinal anesthesia using the FLASH Navigation System with 7D Technology. With less-invasive spine surgery, select patients may be able to undergo lumbar fusions under a spinal anesthetic in an outpatient setting. This requires a team approach between the surgery, anesthesia, nursing, physical therapy, and social work teams. It involves significant input from anesthesia colleagues in patient selection and performing reliable and safe spinal anesthetics, as well as multimodal pain management including modern regional blocks in the lumbar spine. Additionally, it requires well-trained nursing staff in the recovery room to monitor patients for recovery of neurologic function, physical therapy colleagues to evaluate safety for discharge home from the PACU, and case managers to follow up on the home situation to ensure patients have a safe setting and resources to recover at home. This new approach requires collaboration with like-minded surgeons and institutions.

Conclusion:

This case report highlights the innovative use of spinal anesthesia and the FLASH Navigation System to perform an outpatient less-invasive spine surgery for a patient with L4 spondylolysis with dynamic anterolisthesis, who could not have general anesthesia due to a prior near-fatal pulmonary embolus with intubation. The time under anesthetic was minimized due to the speed and efficiency of the radiation-free FLASH Navigation registration.

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