

FLASH[™] Navigation with 7D Technology

CASE STUDY



Surgeon Profile(s)

SURGEON
Jeremy Steinberger, MD

LOCATION
Mount Sinai Hospital Corpus
New York, NY, USA



SURGEON
Frank Yuk, MD

LOCATION
Mount Sinai Hospital Corpus
New York, NY, USA



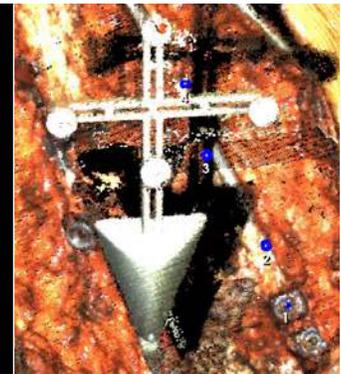
SURGEON
Matthew Carr, MD

LOCATION
Mount Sinai Hospital Corpus
New York, NY, USA

mismatch of 40°. He had a negative coronal balance of 3.7cm. The preoperative x-rays and CT scan of the thoracolumbar spine showed a fractured rod on the left side between L1 and L3 and an iatrogenic fusion in flat back with pseudarthrosis of the upper and lower segments of his instrumentation. His complex anatomy included previously resected pedicles on the right side of L2 and L3 from an intradural resection of a neurofibroma, a narrow pelvis, and small thoracic pedicles.



Preoperative CT scan thresholded to perform FLASH Registration with existing hardware.



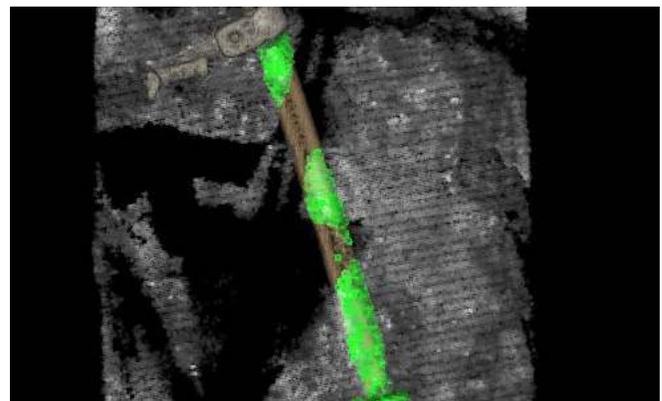
Structured light image shows corresponding patient selected points on the existing rod to complete FLASH Registration.

Case Highlights

- Registrations performed
 - Average registration workflow time: 66.6 sec.
 - Average 7D processing time: 6.6 sec.
 - Average points registered: 6,591

Clinical Presentation

A 59 yo male with history of hypertension, diabetes, neurofibromatosis 1, benign prostatic hyperplasia, previous laminectomies of unknown levels in 1997 with subsequent instrumented fusion from T11 to S1 and tumor resection in 2013 presents with worsening gait, left sided posterior thigh pain, complete left foot drop, and severe low back pain. He had been ambulating using a cane and over the past few months worsened to using a rolling walker. He had a severely positive sagittal balance of 20cm C7 sagittal vertical axis and a lumbar lordosis to pelvic incidence



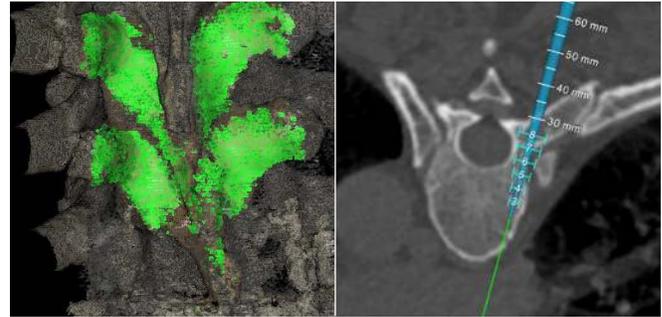
Thousands of matched points to existing hardware displayed in green during FLASH Registration.



Axial views of pedicle cannulation during navigation as displayed on the FLASH Navigation System.

Surgical Procedure

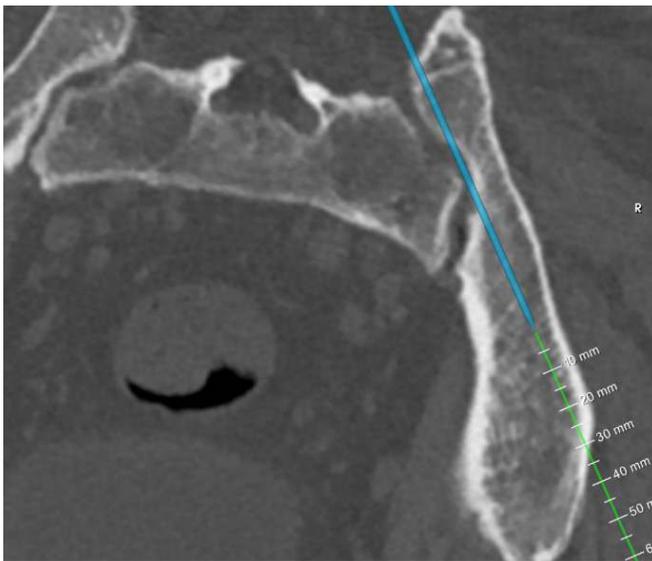
Prior to the surgery, the patient's preoperative CT was segmented using the FLASH™ Navigation System. The previous incision was reopened and extended as needed. Standard subperiosteal dissection was performed from T4 to the pelvis, exposing the existing hardware. The spinous process clamp and array was used to navigate and place the pedicle screws from T4 to T10. However, the lack of spinous processes from T11 to the pelvis provided a challenge due to the need of repositioning the majority of the screws from the prior instrumentation. The previous left sided screws were then removed from T11–L1 and L4–S1. The L3 screw was left in place. The 7D array was attached to the prior L3 screw tulip and then used to register the lower thoracic and lumbopelvic regions. The previous right sided instrumentation was used as registration points. After placement of the left sided screws, the right sided instrumentation from T11 to S1 was then removed and the screws were repositioned. Bilateral S2–Alar Iliac screws, were then placed using the same registration as well as a right sided iliac bolt. An L4 pedicle subtraction osteotomy was then performed.



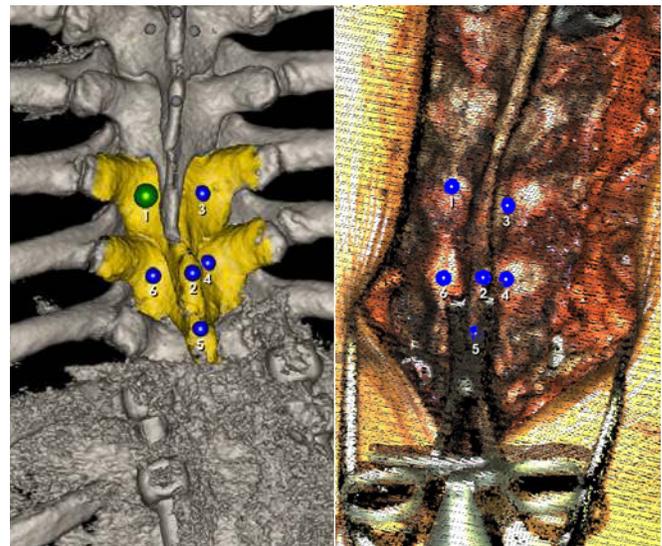
Thousands of matched anatomical points displayed in green during FLASH Registration. Axial view of navigation as displayed on the FLASH Navigation System.

Clinical Outcome

Postoperative CT scan and standing x-rays showed excellent placement of the screws as well as ideal sagittal and coronal balance correction. The patient did well postoperatively with no new complaints aside from expected and well-managed surgical site pain, which improved with time. He began walking on postoperative day two, with a rolling walker, and went to acute rehabilitation one week later. His left thigh pain improved and his overall strength in his lower extremities also improved, however, with no change in his chronic left foot drop. His pre-existing chronic back pain intermittently persists but is controllable. He shows progressive improvement in his activities of daily living with therapy. His incision healed well.



Axial view of iliac bolt navigation as displayed on the FLASH Navigation System.



Preoperative CT and FLASH image showing thoracic block registration. Existing hardware is displayed in the CT and visible to the machine vision cameras using 7D technology.



Preoperative CT with points selected in a thoracic block registration and FLASH image with corresponding patient selected points.

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