ROBOTIC SPINE SURGERY

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ROBOTIC SPINE SURGERY

- No Disclosures - Hopefully in the future I will

SPINE SURGERY CHALLENGES

- Patient Expectations
  - Safe
  - Successful
  - Definitive
- Human Factor
  - Misplaced Screws
  - 0.8% to 2% chance of nerve damage
- Clinical Challenges
  - Anatomical challenges (deformities, revisions)
  - Minimally invasive - Field of View
- Occupational Risk
  - Increased risk of cancer
  - Increased incidence of cancer - Orthopedic surgeons vs non-radiation exposed surgeons
REVOLUTIONIZED SPINE SURGERY

- Navigation
- Improve patient care
- Enhance Surgeon Capabilities
- Precision
- Overcome Clinical Challenges
- Anatomical Variants
- Increase Occupational Variants
- Less Radiation

ROBOTIC SPINE SURGERY

- Open
- MIS
- Percutaneous
- Instrumentation
  - Pedicle screws
  - Translaminar facet screws
  - Transfacet Screws
  - Sacrolilac Screws

Oncology
- Biopsies
- Tumor Resection
- Cement Augmentation
  - Kyphoplasties
  - Vertebroplasty
- Revision Surgery
POTENTIAL BENEFITS - ROBOTICS

- Planning of Pedicle Screws
  - Preoperative Planning vs Intraoperative planning
- Eliminating Human Error
- Learning Curve
- Faster learning curve than navigation alone
- Less Radiation
- Surgeon, Patient, OR Staff

ROBOTIC SPINE SURGERY

- Mazor X - previous renaissance/Spine Assist - spine only
- TransEnterix - SurgiBot and ALF-X - laparoscopic procedures and spine
- Globus Excelsius GPS
  - KB Medical - AQRate Robotic Assisted Spinal Surgery - (not approved in the US) - Spine only
- Medtech ROSA - spine and neurosurgical procedures
- Intuitive Surgical - da Vinci robotics - laparoscopic and spine
ROBOTIC SPINE SURGERY

Mazor X - Mazor

Excelsius GPS - Globus

MAZOR - RENAISSANCE

ROBOTIC SPINE SURGERY -

- Robotic guidance - (Mazor)
  - Navigational assistance (if used with the O arm)
- Robotic and Navigational Guidance - (Globus)
  - Planning
    - Preoperative CT
    - CT to Fluoro
    - Intraoperative CT
    - Scan and Plan
  - Open and Closed system
WORKFLOW
- Preoperative CT scan
- Preoperative Planning
- Mazor X Align Planning Software
- Drill/Tap/Screws
- Facetectomies/Decompressions
- PCO's
- +/- TLIFs
- Corrective Procedures

PLANNING - ROBOTIC SPINE
Preoperative Plan with CT scan -
“CT to Fluoro”

Intraoperative CT scan
O ARM
“Scan and Plan”

PLANNING -
Preoperative
- CT to Fluoro
  - Higher quality CT scan
  - Deformity Cases
  - Shorter OR time
  - Less anesthesia

Intraoperative
- Scan and Plan
  - shorter cases
  - 1 or 2 level cases
  - Trauma setting
  - Disadvantages
    - unable to plan at once, if longer construct
    - longer anesthesia in deformity cases
    - unable to see global alignment
    - lesser quality ct scan
**MAZOR X ALIGN SOFTWARE**

- Scoliosis Film
- Preoperative CT scan 1mm Cuts
- Flexibility Index
- Prediction of Correction - Interbody grafts/osteotomies, etc.
- Global alignment
POINTS OF ATTACHMENT

- Multiple Attachments - Mazor
  - Spinous Process Clamp
  - Right PSIS docking for Robotic Arm
  - Posterior Superior Iliac Spine (Scan and Plan)
  - Docking point - Mazor Right PSIS
  - Medtronic Reference Frame into Left PSIS
- Future: 1 docking station on the PSIS for the robotic arm and the Medtronic Reference Frame
- Globus - Floor mounted system, no attachments to the patient
PROCEDURE

- Begin Pedicle Screw Placement
- Select Level
- Robotic Arm Moves into position
- Small Incision - through fascial layer
- Dock the inserter on bone
PROCEDURE

- Drill to 30 mm into the pedicle
- Place K wire into the pedicle
- Remove the dilator that is docked on the bone
- Repeat at all levels
- Screws placed over the K wire
### WHY NOT JUST USE NAVIGATION?

- Repeatability
- Drill, Kwire, tap, screw
- Stability
- Navigation
- Alignment alone
- Robotics
- Mazor - Segmentation
ROBOTIC SPINE SURGERY - WHATS NOW AND NEXT?

- Open and Closed systems
- K wireless systems
- Premade Rods
- Navigation and Robotic - one system
- Preoperative Software
- Prediction of Correction

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