NAVIGATION AND ROBOTICS USE IN SPINE SURGERY

ADVANTAGES

- Tissue sparing
- Less radiation
- Improved accuracy
- More efficient
- Improved safety
- Better outcomes

SPINE SURGERY CHALLENGE

- Patient expectations
- Clinical challenges
- Human factor
- Occupational risk
NAVIGATION/ROBOTICS

SPINE SURGERY CHALLENGE

NAVIGATION

• INTRAOPERATIVE CT
• NAVIGATIONAL SOFTWARE
• FIDUCIARY MARKERS (GPS)
• NOT AN ASSISTANCE MECHANICAL DEVICE
• NOT REAL TIME

TYPES OF NAVIGATION PLATFORMS

• O-ARM, STEALTH
• BRAINLAB, ARROW
ROBOTICS

QUESTIONS THAT MUST BE ASKED?

• ARE ROBOTS READY FOR THE OPERATING ROOM?
• WILL THEY HELP US WITH SAFETY AND EFFICIENCY?
• MOST IMPORTANT, WILL PATIENTS BENEFIT FROM THE TECHNOLOGY?

ROBOTS FOR SPINE SURGERY

• WHAT IS IMAGINED AND WHAT IS REAL
• NOT A SURPRISE
  - HIGH RESOLUTION IMAGING
  - RAW 3D COMPUTING POWER
ROBOTS

- 2 TYPES OF ROBOTS
  - SUPERVISORY-CONTROLLED
    - AUTOMATED ASSISTANCE SYSTEMS
  - MASTER SLAVE SYSTEMS
    - DA VINCI ROBOT

BENEFITS OF ROBOTIC APPLICATION?

- IMPROVED SAFETY, ASSIST WITH DELICATE AND COMPLICATED PROCEDURES
- REDUCED RADIATION
- SPEED UP RECOVERY TIME, REDUCING POST-OPERATIVE PAIN, LESS TISSUE DAMAGE, LESS INVASIVE

WHEN TECHNOLOGY DISAPPOINTS
RADIATION RISK

RADIATION INDUCED LYMPHOMA

THREE TYPES OF ROBOTS USED IN SPINE SURGERY

- MAZOR RENAISSANCE SYSTEM
- ROSA SPINE
- CARDAN
MAZOR
- LOW DOSE CT
- PREOPERATIVE PLANNING
- FLUOROSCOPY: AP AND OBLIQUE VIEW

ROSA AND CARDAN
- 3-D IMAGING CT INTRAOPERATIVE

DRAWBACKS

- INCREASED OPERATING TIME
- ECONOMIC INVESTMENT

CARDAN SURGICAL
PROCEDURE OF OPERATIONS

• PRE-OPERATIVE PLAN
  - LOW DOSE CT
• REGISTRATION
  - MOUNTING PLATFORM
  - INTRA-OPERATIVE FLUOROSCOPY AP AND OBLIQUE
• EXECUTION OF PRE-OPERATIVE PLAN
  - PLACEMENT OF ROBOT ON PLATFORM

PREOPERATIVE PLAN

LOW DOSE CT

ROBOTIC PLATFORM
CLINICALLY VALIDATED TECHNOLOGY


CLINICAL EVIDENCE

Compared to freehand surgery, in 153 cases, using integrated planning and robotic guidance for surgical navigation significantly:
- Improved implant accuracy by 10%
- Reduced X-ray exposure by 15%
- Reduced complication rate by 40%
- Reduced complications 40%
- Reduced average length of stay 27%

EVIDENCE

83.7% Accuracy of 1,815 implants in 126 scoliotic adolescents.
IMPROVED SAFETY

PEDICLE SCREW PLACEMENT IS ASSOCIATED WITH RISK OF MALPOSITIONING

- INJURY TO SPINAL CORD, VESSELS, OR SPINAL CORD

- IMAGE GUIDANCE NAVIGATION OVERCOMES MANY OF THESE CHALLENGES

- COMPLEX CASES

- ROBOTICS GUIDES THE SURGEON’S HANDS

- FINDING THE PERFECT TRAJECTORY

TESTIMONIALS

"The greatest value of the consistent accuracy of procedures is obvious, keeping our patients safe." - Prof. K. Schmieder, MD, Germany

"It took me 10 years to deal comfortably with it until I felt that within 10 cases I have achieved. Now I do things I couldn't do before, which improved our overall care." - Dr. M. Weidner, MD, Germany

"Using Mazor Robotics, planning you can actually go through your second operation a day before the first and save a lot of time. It makes the procedure more efficient and the patient more comfortable." - Dr. J. Schram, MD, The Netherlands

"The Mazor Robotics system creates a precise and safe surgical environment." - Dr. L. Holman, MD, USA
CONCLUDING COMMENTS

ROBOTICS

- NEW TECHNOLOGY
  - TIME TO GETTING USED TO
  - REQUIRES INFORMATION TO WORK
  - TRANSFERRING IMAGING FROM RADIOLOGY SERVER TO ROBOT SYSTEM
  - PLANNING
    - INTRAOPERATIVE REGISTRATION
    - EXECUTION OF PLANNED SURGERY

ROBOTIC LIMITATIONS

- MANY PARTS OF SPINE SURGERY REMAIN OUT OF REACH FOR ROBOTIC APPLICATION
  - MICROSURGICAL DECOMPRESSION
  - DISC REMOVAL
  - INTRADURAL WORK
CONCLUSION

INTRODUCTION OF ROBOTICS TO SPINE SURGERY HAS ONLY JUST BEGUN

ACCURACY OF ROBOTIC ASSISTANCE IS MATCHED WITH EXPERT SPINE SURGEON.

NO CLINICAL EVIDENCE OF BETTER OUTCOMES

ACCURACY, PRECISION, EFFICIENCY = IMPROVED SAFETY= BETTER OUTCOMES

WILL REVOLUTIONIZE SPINE SURGERY

PERSONAL EXPERIENCE

LESS EXPOSURE OF DAILY RADIATION

SHORTER OR TIMES

IMPROVED OUTCOMES

NOT AS MENTALLY AND PHYSICALLY DRAINING

THANK YOU

DAVID VERST MD

VERSTSPINE CARE