Pedicle Subtraction Osteotomy

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Case JB

- 66 y/o male 74” 235 lbs
- Retired police officer
- C/O low back pain, bilateral leg pain with weakness, numbness and tingling.
- S/P fusion L2-S1 in 2004
  - History of smoking 3 ppd (stopped 10 years ago)
Case: What we know

- Fixed deformity L2-S1 and PJK
- SVA: 13cm
- PT: 29
- LL: 10
- PI: 49
- PI-LL: 39

Spinal Alignment

- Sagittal Profile
  - Ideal: all spinal parameters normal
  - Compensated Sagittal: Local or regional deformity. Sag balance maintained (CAM < 2cm)
  - Global Sagittal Imbalance: Can't stand without assistive device

Challenges of Reconstructing Sagittal Imbalance

- Elderly Patient
- Co morbidities
  - PVD
  - Organ failure
  - DM
  - Inflammatory conditions
- Nutrition
- Extensive Pain Management
- Obesity
- Habits
- Beliefs
- Social situation
- Previous Surgery

- Surgical Procedure(s)
  - Surgeon Skill
  - Resources / Hospital
  - Approach
    - Single, 360, 540 etc
  - Technical Aspect
    - Equipment
    - Fusion levels
    - OSTEOTOMY?
Spine Osteotomies

- Smith Petersen Osteotomy
- Pedicle Subtraction Osteotomy
- Vertebral Body Resection

PSO

- Originally described for AS
- Correction
  - three column
  - posterior (one) approach
- maximizing the healing potential
- avoid stretching major vessels and viscera

PSO

- Average correction
  - 30-40° at a single segment
- Indications
  - Mostly lumbar level
  - Ideal candidates for PSO
    - sagittal imbalance of >10 to 12 cm
    - a sharp, angular kyphosis
    - circumferential fusion, multiple segments

Technical Aspects of PSO

- Extensive Pre op planning
- 2 Skilled Surgeons
- Blood and Blood Products Available
- TXA
- Hinged OR Table (Axis Jackson Table)
- Osteotomy Set

Axis Jackson Table

Osteotomy Set
Controlled Steps In Pedicle Subtraction Osteotomy

- Put in screws first
- Temporary rod

PSO

ALF L3-S1, PSO L2 and L4
PSO Complications

- Early
  - Death
  - Neurological deficit
  - Excessive blood loss/coagulopathy
  - Wound dehiscence
  - CIVK
  - AKI
  - Post-op Respiratory distress
  - Pneumothorax
  - Cardiac
    - MI
    - Arrhythmia
  - Thoracic kyphosis
  - Scoliosis curve progression

- Late
  - Venous DVT
  - Post-op Respiratory distress
  - Pneumothorax
  - Venous DVT
  - Pneumothorax
  - Wound infection
  - CSF leak
  - Scoliosis curve progression
  - Venous DVT
  - Post-op Respiratory distress
  - Pneumothorax

The prevalence of PJK at 5+ years postop was 39%.

PJK progressed
- Significantly within 8 weeks postop (59%)
- Between 2 years postop and ultimate follow-up (35%)
- Older age at surgery (>55 years) and combined anterior and posterior spinal fusion

Results: 75 PSOs (37 single surgeon and 38 two surgeon)
- Mean number of levels
  - Posterior spinal fusion (8.82 vs 8.05)
  - Spinal decompression (2.71 vs. 3.18)
- EBL (mean)
  - Single surgeon: 6401ml
  - Two surgeons: 4990ml (p-value=0.0000)
- Average surgical time:
  - Single surgeon: 423 min (7.21 hrs)
  - Two surgeons: 213 min (6.85 hrs) (p-value=0.0000)
OUTCOME AND COMPLICATIONS OF PEDICLE SUBTRACTION OSTEOTOMY IN CASES WITH SINGLE VERSUS TWO ATTENDING SURGEONS
Sassan, Keshavarzi; Deviren, Vedat; Ames, Christopher; University of California San Francisco, Ca

• Conclusion:
  – 2 experienced surgeons working simultaneously:
    • reduces operative time and blood loss.
    • decreased infection and other medical complication
  • Less stress

PSO Retrospective Review

• 2 Experienced Surgeons
• 43 Patients over 7 years
  – Average Age: 60.3
  – 32 with Previous Spine Surgeries
• Avg. Surgery Time 6:57
  – 417 min (including anesthesia)
• Avg. EBL: 1784mL
• Avg. Blood Given: 2.8 units
• Complications: 8 dural tears, 1 death, 1 PE, 1 deep infection
Correcting Sagittal Balance

- Restore C7 plumb line
  - Goal SVA < +5cm
- Restore spinopelvic alignment
  - Goal PT < 20 degrees
  - Goal LL = PI ± 9 degree

Single PSO

2 PSOs
THANK YOU