Disclosures
Consultant - Aesculap
Royalties - Activ L
The Future of Surgery for Degenerative Spine

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Predicting the Future

- Those who have knowledge don’t predict. Those who predict don’t have knowledge.

- Those who cannot remember the past are condemned to repeat it.
The Evolution of Spine Surgery

- Deformity / Scoliosis
- Trauma
- Infection
- TB
- Degenerative
The Past

- 1932 - 1st intentional discectomy by Mixter / Barr
- 1970s - Myelo/CT
- 1976 - 1st issue of (Journal of) Spine Journal, Henry La Rocca
- 1986 - 1st meeting of NASS
- 1990s - MRI
- 1997 - Microtubular surgery - Foley and Smith
- 2001 - The Spine Journal
- 2007 - SMISS formed
The Past

• 1960s - Harrington

• 1980s - Pedicle screws

• BAK approval 9/20/1996

• Ray Cage approval 10/29/1996

• 1998 - Reclassification of Pedicle Screws

• BAK C - 4/20/2001

• In Fuse 7/2/2002
The Present

- Minimally Invasive
- Lateral Approach
- Arthroplasty
- Robotics
The Factors & Forces Influencing Future of Degenerative Spine Surgery

- Aging population
- More active population
- Better avoidance/management of osteoporosis
- Better Anesthesia
- Easier access to latest technology
- Better Complication Avoidance
- Better Complication Management
The Near Future

- Minimally Invasive
- Lateral Approach
- Arthroplasty
- Robotics
- Biomaterials /Nanotechnology
Minimally Invasive Spine Surgery

• Less collateral damage
• Outpatient
• Quicker recovery
• Better Outcomes?
Lateral Approach

- Introduced in 2006
- Popularized by Pimenta (XLIF)
- Small lateral incision
- Minimal blood loss
- Avoids vessel retraction
- Powerful deformity correction
The Future - Arthroplasty

What is missing?
Cervical Arthroplasty

- Maintains or Restores Motion
- Lower rate of Adjacent Level Degeneration
- Lower re-operation rate
A prospective, randomized, multicenter Food and Drug Administration investigational device exemptions study of lumbar total disc replacement with the CHARITE artificial disc versus lumbar fusion: part I: evaluation of clinical outcomes.


- 304 patients

- Conclusion: This prospective, randomized, multicenter study demonstrated that quantitative clinical outcome measures following lumbar total disc replacement with the CHARITE artificial disc are at least equivalent to clinical outcomes with anterior lumbar interbody fusion.
Results of the prospective, randomized, multicenter Food and Drug Administration investigational device exemption study of the ProDisc-L total disc replacement versus circumferential fusion for the treatment of 1-level degenerative disc disease.


- 286 patients

- Conclusion: ProDisc-L has been found to be safe and efficacious. In properly chosen patients, ProDisc-L has been shown to be superior to circumferential fusion by multiple clinical criteria.
Lumbar disc arthroplasty with Maverick disc versus stand-alone interbody fusion: a prospective, randomized, controlled, multicenter investigational device exemption trial.


- 577 patients: 405 TDR 172 ALIF

- Conclusion: The investigational group consistently demonstrated statistical superiority versus fusion on key clinical outcomes including improved physical function, reduced pain, and earlier return to work.
Lumbar Disc Replacement for Discogenic Low Back Pain: Tow Year Outcomes of the Activ L Multicenter Randomized Controlled IDE Trial


- Spine, 2015 Dec; 40(24), 1873 - 1881

- 324 patients: 218 activ L / 106 control (Charite / Prodisc L)

- Activ L was noninferior with protocol defined analysis showed activ L to be superior to controls.

- Radiographic success significantly higher for activ L
Lumbar Arthroplasty

- Maintains or Restores Motion
- Lower Adjacent Level Degeneration
- Lower Re-operation
- Higher Patient Satisfaction
- More Cost Effective
Robotics/Navigation

- Navigation is like GPS
- Robotics is like autonomous cars
- When was the last time you looked at a map?
Biomaterials/Nanotechnology

- Nanometer is 1 billionth of a meter or about 3 atoms long
- Nanotechnology deals with dimensions < 100 nanometers
- Nanotechnology in spinal implants deal with surfaces designed to enhance osteogenic environment
The Distant Future

- Disc Repair
- Disc Regeneration
- Spinal Injury Repair
- Spinal Damage Regeneration
- Injury/Degeneration Prevention
The Really Distant Future

- A robot doing minimally invasive prophylactic biologic interventions of asymptomatic individuals who were routinely screened for spinal abnormalities.
Conclusion

- Future of Degenerative Spine Surgery is - Growth

- Outcomes depend on;
  - accurate diagnosis
  - patient selection
  - appropriate surgical intervention

- The main factor determining outcomes is the surgeon.
Thank You!