Adult Spinal Deformity

P. R. Lucas M.D.
Rehab Conf. 10/28/16
Adult Spinal Deformity

• Introduction
• Etiology
• Presentation and Treatment
• Outcomes and Complications
• What the Future Holds
Introduction

Adult Spinal Deformity (ASD)
  Becoming more common
  Often a cause of pain and disability
  Increases with age
  More and better treatment options
Introduction

Adult Spinal Deformity
Scoliosis

Kyphosis

Sagittal Imbalance
Scoliosis
Kyphosis
Saggital Imbalance
Population 65+ by Age: 1900-2050
Source: U.S. Bureau of the Census
Adult Spinal Deformity

Quality of Life Affected
- Functional limitations
- Increased pain
- Use of analgesics

Baldus et al. Spine 2008
Adult Spinal Deformity

Psychological Effect

Social Stigma
Depression
Anxiety

Beven et al. Spine, 2003
Adult Scoliosis: Taking Its Toll

Score on SF-36

Physical functioning | Role physical | Bodily pain | General health | Vitality | Social functioning | Role emotional | Mental health

Scoliosis Patients

General U.S. Population

Test Variable
ETIOLOGY OF SPINAL DEFORMITY

PROGRESSION of an early deformity

LATE DEFORMITY resulting from:

– DEGENERATION
– METABOLIC (OSTEOPROPSIS, OSTEOMALACIA)
– TRAUMA, TUMOR, INFECTION
– INFLAMMATORY (A. Spondylitis)
– IATROGENIC
Progression of Deformity
Curve progression

\[ \text{Thoracic curve slope: } 0.75 \]
\[ \text{L or TL curve} \]

\[ \text{Lumbar curve slope: } 0.68 \]
\[ P: 0.013 \]
\[ R: 0.86 \]

Type A: F, DM, men: 0, age RS 32 years, n=7

Source: Spine © 2007 Lippincott Williams & Wilkins
**Curve Progression**

- **<30**
  - Will not progress after skeletal maturity

- **30 - 50**
  - Progress 10-15 in lifetime

- **>50**
  - Progress about 1 per year

- **>90**
  - Affect cardiopulmonary function
ADULT ONSET SCOLIOSIS

33 yrs  50 yrs  55yrs
Degenerative Scoliosis

Biochemical changes in disc
Degenerative arthritis of facets
Structural instability
Loss of bone mass (Remodeling)
Decrease in muscle strength
Degenerative arthritis of spine
Degenerative Scoliosis

Muscle mass and ASD

Compared with patients without ASD

Significant less mass in paraspinal and psoas in patients with ASD

Yagi et al. Spine, 2016
Loss of Muscle Mass

Sarcopenia

- Age-related
- Sex hormones
- Apoptosis
- Mitochondrial dysfunction

- Cachexia

- Starvation
- Malabsorption

- Neurodegenerative diseases
- Motoneuron loss

- Disuse
- Immobility
- Physical inactivity
- Zero gravity

- Endocrine
- Corticosteroids
- GH, IGF-1
- Thyroid
- Insulin resistance
Progression of Adult Curves

- Spinal Degeneration
  - Boney adaptation
  - Soft tissue integrity lost
  - Scoliosis Progression
    - Functional unit instability increased
Scoliosis in Adults

Idiopathic

Degenerative
# ADULT SCOLIOSIS

<table>
<thead>
<tr>
<th>EARLY ONSET</th>
<th>ADULT ONSET</th>
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<tbody>
<tr>
<td>PAIN</td>
<td>31%</td>
</tr>
<tr>
<td>CURVES</td>
<td>52(34-78)</td>
</tr>
<tr>
<td>AGE</td>
<td>42 YEARS</td>
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<tr>
<td>SEX</td>
<td>FEMALE</td>
</tr>
<tr>
<td>LOCATION</td>
<td>COMPENSATORY</td>
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<tr>
<td></td>
<td>LUMBAR</td>
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Loss of Bone Mass
Spinal Trauma
SPINAL DEFORMITY

RESULT OF

- Metastatic Disease
- Infection
Ankylosing Spondylitis
Iatrogenic Deformity
SPINAL DEFORMITY IN ADULTS

• CLINICAL PRESENTATION
  – PAIN
  – COSMETIC DEFORMITY
  – NEUROLOGIC SYMPTOMS
  – PULMONARY COMPROMISE
  – PROGRESSION
Evaluation of patient with ASD

Treat the PATIENT with the Deformity
Major Complaint(s)
Medical History
Physical Exam
  painful movements
Neurologic exam
Diagnostic studies
“I can straighten that spine”
PAIN

THE PRIMARY COMPLAINT IN ADULTS WITH SPINAL DEFORMITY
Spinal Pain
An unpleasant sensory and emotional Experience
Associated with actual or potential tissue damage
Where is the pain coming from?
Pain generators

Fig. 1 * indicates pain-sensing structures
Spinal Deformity and Pain

Back pain in elderly is common
  60% over 60 yrs have pain
Spinal deformity is common
  68% over 65 years have deformity
Not all deformity is painful
Not all with pain have deformity
LOCALIZATION OF PAIN SOURCE

History

Physical

X-rays/MRI

Diagnostic injections
Adult Spinal Deformity

Treatment Options
  Prevention
  Nonoperative Modalities
    Physical therapy
    Chiropractic
    Bracing
  Pain Management
Surgical Intervention
Adult Spinal Deformity

Non-surgical Modalities

Physical therapy is beneficial
Barros et al. 2002

Chiropractic Treatment
Everett et al. Spine, 2007

Pain Management
Cooper et al. 2004
Non-surgical Treatment

Aerobic fitness
Weight-bearing exercises
Core stabilization
Spinal mobilization
Pain management

Medications

Steroid Injections

Ablation procedure
Non-surgical Treatment

Should always be tried

Difficult to evaluate how effective

Multiple variables

Kind of deformity, degree, age

Type of treatment

Exercise, manipulation, brace

Injections

Everett et al. 2007
SURGICAL TREATMENT

Many different clinical presentations
Broad range of surgical approaches
Goals of surgery
  - Address major pathology
  - Minimize iatrogenic trauma
  - Prevent progression/recurrence
SURGICAL TREATMENT

STABILIZATION
CORRECTION AND BALANCE
DECOMPRESSION (if necessary)
Advances in Surgery

Preoperative preparation
Nutrition, Pulmonary, Cardiac

Surgery
Monitoring, Surgical time
Implants
Surgical Approach
Evolution of Spinal Implants
Spinal Osteotomy
Advances in Surgery

Postoperative
Early mobilization
Anticoagulation
REHAB
Surgery in ASD

Surgery is only Part of the treatment

REHAB PROGRAM very important
Patients are debilitated
Change in posture
Many have neurologic deficits
Surgical Treatment

Significant Advances
- Operative techniques and implants
- Perioperative management
- Complex Surgery
- Substantial risks and complications
- High patient satisfaction
Case 1

55-year-old female
Brace treatment as adolescent
Did well for several years
Presents with lower back pain
Has noted change in posture
Case 1

Exam: right thoracic left lumbar curves
Pain left lumbar on extension
Neurologic exam normal

X-rays idiopathic scoliosis

Treatment plan: Physical therapy
Case 1

Minimal improvement
Also tried chiropractic treatment
Pain management
Feels she is becoming more disabled
Surgery discussed in detail
Case 1
Postoperative Course

Hospitalized 4 days
Transferred to acute rehab
Two weeks of rehab
Follow up 12 months less pain
Pleased with her appearance
Case 2

76 y/o male with Parkinsonism
Progressive deformity over few years
Pain but becoming more limited
Parkinson symptoms well controlled
Exam: ambulates slowly with list
Mild Parkinson signs
Able to correct posture passively

Diagnosis: progressive scoliosis
Neuromuscular

Treatment plan
physical therapy, trial of brace
Follow up

progressive deformity

• Brace ineffective

Treatment plan

Discussion with Neurologist

Surgical treatment discussed
Surgery long construct

Postoperative
  Post-op delirium
  Ileus, UTI
  Aspiration Pneumonia

After 2 weeks transfer to Acute rehab
Slow progress ambulating with walker
Case 2
Case 3

79 y/o female with scoliosis
Has done well for many years
Hx of osteoporosis but healthy
Major complaint: left lower back, occasionally left thigh
Case 3

Exam: Right thoracic, Left lumbar curves
Limited ROM  Neuro intact
Case 3

Diagnosis:
Progressive idiopathic scoliosis

Treatment plan
Lumbar support
Pool therapy
Facet and Transforaminal Injections
Case 3

Now 84 years old
Continues to remain active
Injections 3-4 times per year
Case 4

51 y/o female with c/o left leg pain
Occasional back pain
Healthy and stands at work

Exam:
left lumbar scoliosis excellent motion
decreased sensation Left lateral calf
Case 4
Case 4

Diagnosis:
- Left lumbar radiculopathy
- Foraminal stenosis  L5 S1

Treatment:
- Transforaminal injection, physical therapy
Temporary relief

Surgery discussed

Decompression of L5 root, no treatment indicated for scoliosis
Case 4

Did well for 6 years
Increasing back pain limiting activity
Poor response to physical therapy
Feels deformity is increasing
Surgery discussed and planned
Surgical Outcomes

Successful Outcomes Dependent On
Patient selection
healthy, motivated, expectations

Surgical /hospital expertise

Rehab program
Surgical Outcomes

ODI  Oswestry Disability Index
pre-op 49%,  post-op 24 %

Daub  et al 2007
Complications

Operative
  Neurological

Postoperative
  Early: pulmonary, infection
  Late: infection, failure of fusion, implant failure
Complications

Up to 50% of patients have a complication

Major complications 13%-20%
- Pseudoarthrosis 5-27%
- Residual pain 5-15%
- Mortality 1-5%
- Neuro deficit 1-5%
- Infection 1-5%
- Pulmonary embolism 1-20%
Conclusion

ASD
Common and increasing problem
Many causes
Patients require thorough evaluation
Nonsurgical treatment should be tried
Surgical treatment can be effective
consider risk/benefit ratio
rehab program is important
The Future

Prevention
  Treatment of Osteoporosis
  Exercise

Nonsurgical
  Pain Management
  Physical therapy
Surgical Treatment

Minimal Invasive techniques
Computer Navigation
Motion Sparing Implants
Use of Biogenics
Robotic Surgery
Thank You