Goals

• 1,000-foot overview

• Describe spinal etiologies of back and neck pain

• Clarify treatment options:
  • Degenerative disc disease
  • Kyphosis and scoliosis
  • Osteoporosis
Defining Normality
Vertebral segment

- Disc
- Vertebral Body
- Facet Joints
- Spinous process
Intervertebral Disc

Vertebral Body
Aging ➔ Degeneration of Disc

- Loses water and becomes rigid
- Loses volume
- Loses nutrients
A Vicious Cycle

Degenerated Disc Disease

Facet Joint Arthritis
Spinal etiologies of back and neck pain
Neurologic Consequences of the Aging Spine

Radiculopathy ~ Pain in 1 leg
Radiculopathy ~
Pain in 1 arm
Discectomies
Central stenosis

Neurogenic Claudication

Showing symptoms such as aches and numbness
Laminectomy +/- Instrumentation & Fusion
Cervical Myelopathy

Symptoms

- Tingling/numbness in fingers, hands, and arms
- Imbalance / Poor coordination / Clumsiness
- Difficulty grabbing objects
- Loss of fine motor skills (coins, writing)
Laminoplasty

Laminectomy/Fusion

ACDF

Plate
Bone graft
Screw

Lamina with bone spurs
Part or all of lamina is removed

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Other Consequences of Multi-Level Degenerative Disc Disease

- Flatback
- Scoliosis
Scoliosis
Kyphosis (loss of height and leaning forward)
Hyperlordosis
Reduction of TK
Retrolisthesis
Hyperextension
Pelvis backtilt
Knee flexum
Ankle extension
SPINE
PEARLIS
LOWER LIMBS
Other Causes of Kyphosis with Aging

- Compression Fractures
Osteoporosis

Effects of low calcium and decreased estrogen levels on bone

- Low calcium diet
- Decrease in estrogen
- Calcium deficiency slows bone formation
- Estrogen deficiency causes bone loss

Fig. 2

Normal Osteoporosis
DXA (DEXA) Scan
T-Score

- Up to -1
  - "Osteopenia"
    - Diet changes (Calcium/VitD)

- -1 to -2.5
  - "Osteoporosis"

- Less than -2.5
  - Drug Treatment
An-An.-­‐Resorp.on
S.mula.on
Bisphosphonates
Pro-­‐estrogen
Denosumab
(RANK-ligand inhibitor)
Stimulation
Anabolic (Forteo)
Pro-­‐estrogen
<table>
<thead>
<tr>
<th>Drugs</th>
<th>Spine BMD gain (%) / fracture reduction (%)</th>
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<tbody>
<tr>
<td>Bisphosphonates</td>
<td></td>
</tr>
<tr>
<td>Alendronate</td>
<td>5-7 / 30-45</td>
</tr>
<tr>
<td>Ibandronate</td>
<td>4-6 / 32-43</td>
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<tr>
<td>Risedronate</td>
<td>5-7 / 30-45</td>
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<td>Zoledronate</td>
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<td>Denosumab</td>
<td>3-6 / 55-70</td>
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<tr>
<td>Raloxifene (SERM)</td>
<td>1.2-3 / 30-40</td>
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<tr>
<td>Estrogen</td>
<td>3-5 / 35</td>
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<tr>
<td>Calcitonin</td>
<td>1-1.5 / 20-30</td>
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<tr>
<td>Anabolic</td>
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<tr>
<td>Teriparatide</td>
<td>10-15 / 50-65</td>
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<tr>
<td>Strontium Ranelate</td>
<td>2-4 / 20-35</td>
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Prevention of Disc Degeneration?

- Healthy diet
- Minimize weight gain
- Good body mechanics
- Stem Cells?
Sources of Stem Cells

- Olfactory mucosa
- Skeletal muscle
- Intervertebral disc
- Adipose tissue
- Bone marrow
- Synovium
- Embryonic tissue
Efficacy?
Questions