

# Steroid-Induced Osteoporosis and Stress Fractures

Nancy E. Lane, MD

Director, Aging Center

Professor of Medicine and Rheumatology

University of California at Davis

Sacramento, California

# Glucocorticoid-Induced Osteoporosis

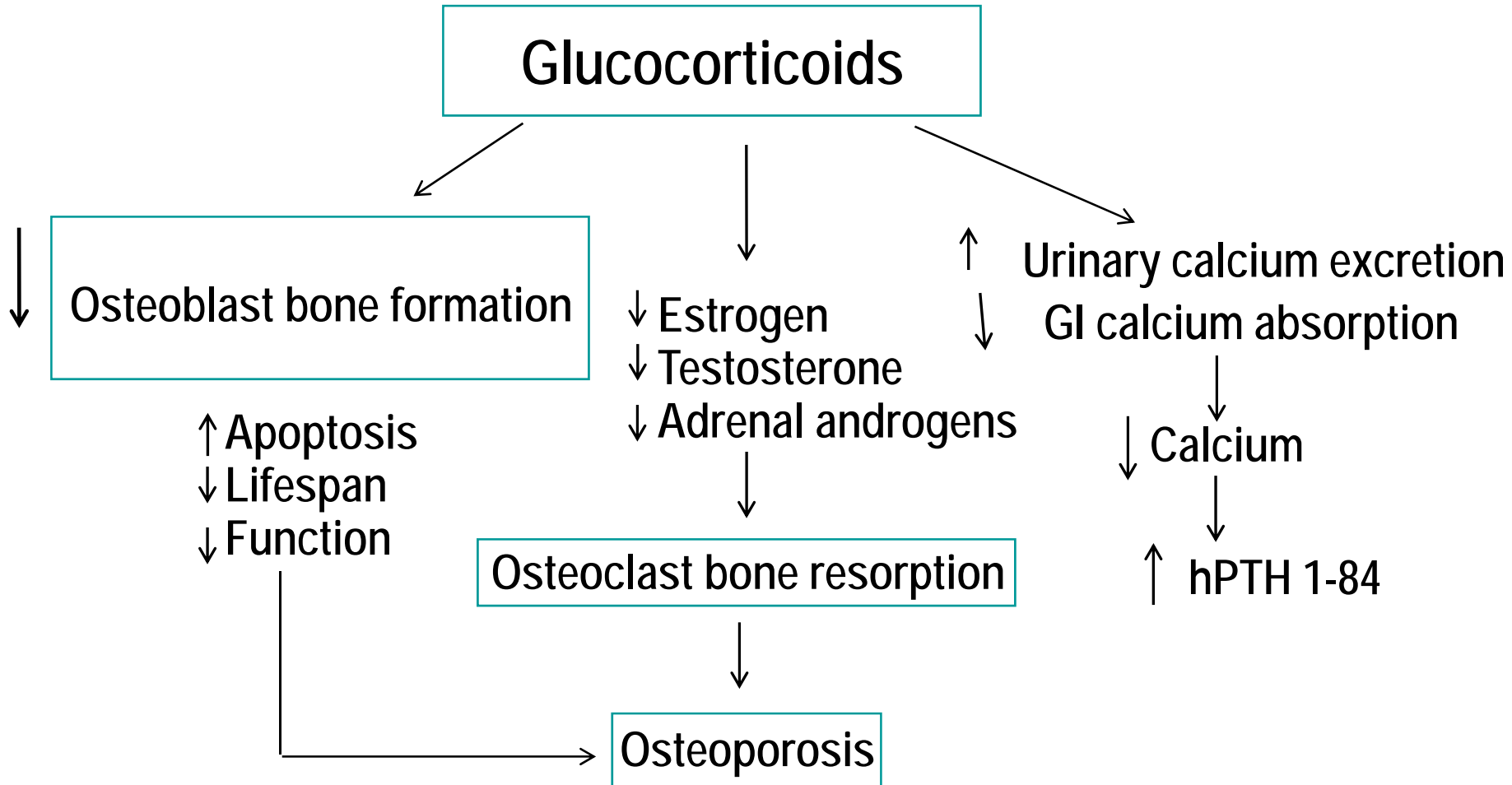
- **Most common form of secondary osteoporosis**
- **Occurs at any age, in both sexes and across ethnic groups**
- **Approximately 30-50% of patients sustain osteoporotic fractures**
- **Common long-term uses:**
  - **Pulmonary and Rheumatologic disorders**
  - **Inflammatory bowel disease**
  - **Organ transplantation**
  - **Neurological diseases**
  - **Skin diseases**

Adinoff et al. *NEJM* 1983;309:265-268

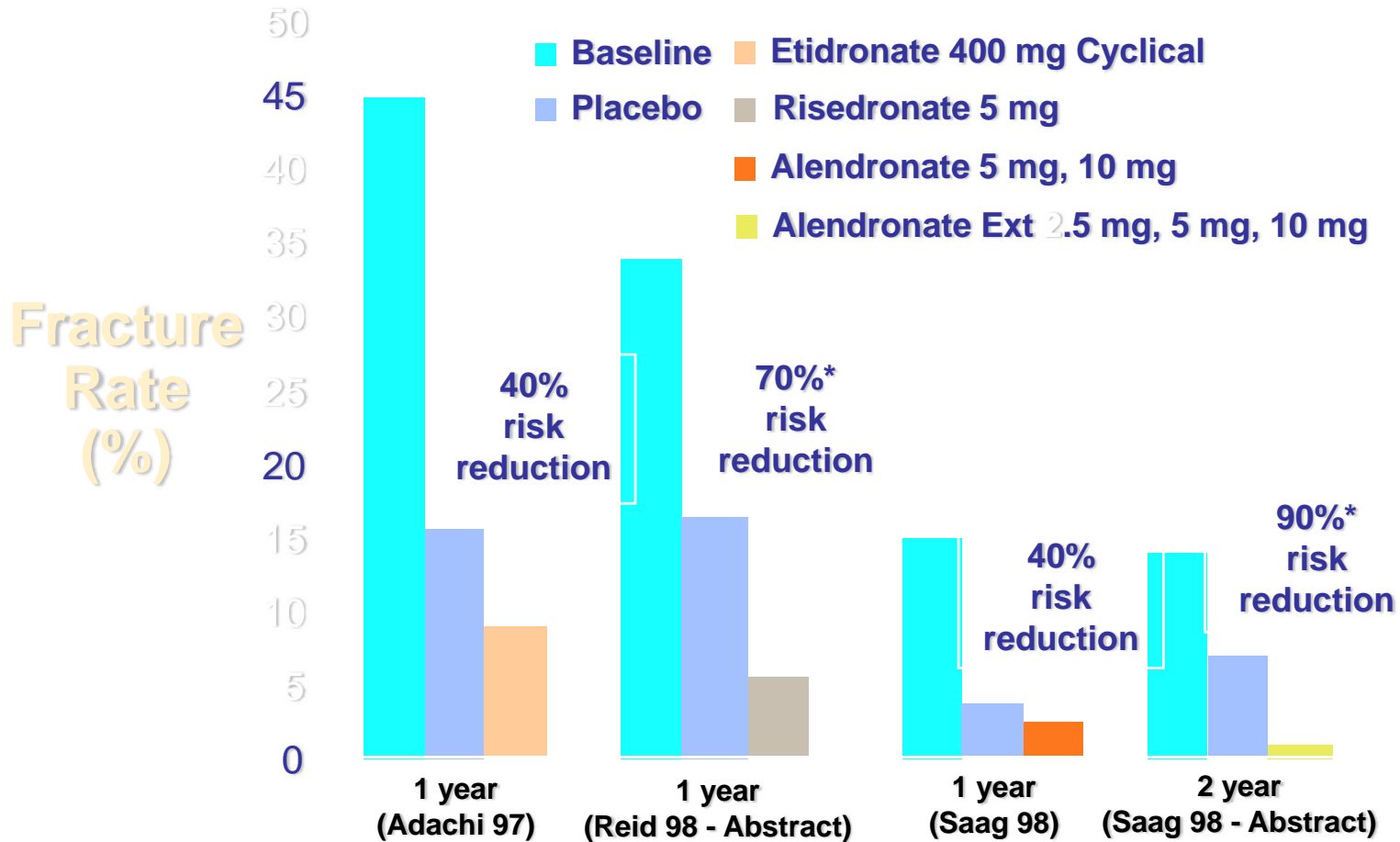
Michel et al. *J Rheumatol* 1991;18:804-808

Lems et al. *Clin Exp Rheumatol* 1995;13:293-297

# Pathophysiology of Glucocorticoid-Induced Osteoporosis



# GIOP Bisphosphonate Trials: Fracture Rate



\*P < 0.05

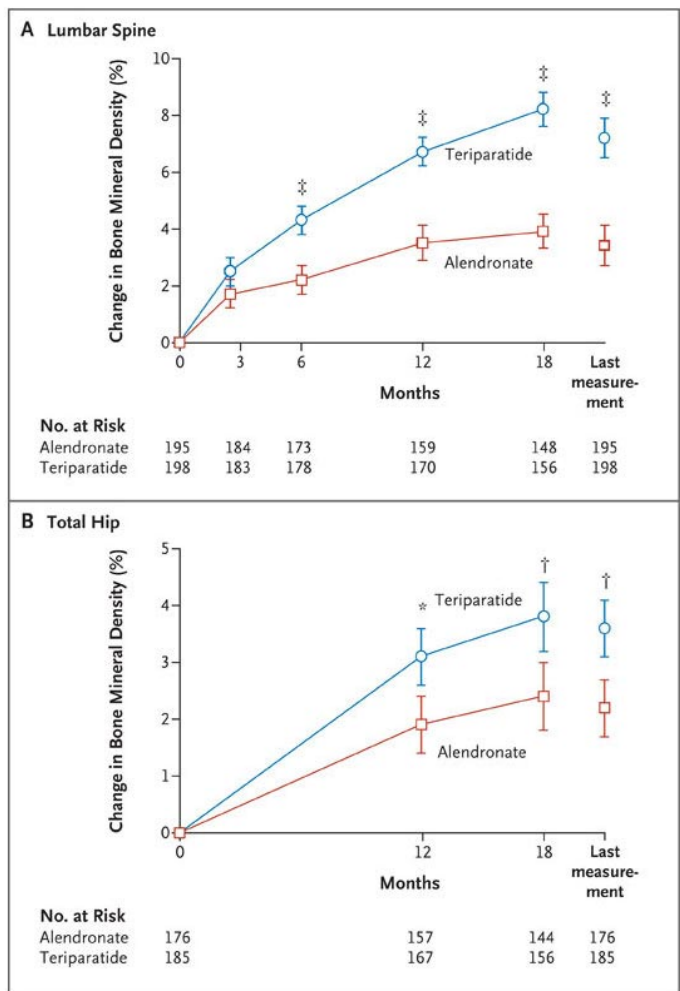
Etidronate Risedronate

Alendronate

# Definitions

- Stress fractures occur from repeated cyclical loading of bone
  - Stress fracture: Occur in bone with normal resistance which has been loaded to excessive demands. Frequent in young adults
  - Insufficiency fracture: Occur in weakened bone. Often over age of 50

# Percent Change in Bone Mineral Density at the Lumbar Spine and Total Hip from Baseline to 18 Months



# Evidence Based Guidelines for the Prevention and treatment of GIOP

- Prevention of GIOP is recommended for all subjects treated with GCs
- Prednisone  $\leq 7.5$ mg a day of  $< 3$  months
  - Calcium (diet+ supplement 1500mg/d) and vitamin D  $\geq 800$ IU/d supplementation only
- Prednisone  $\geq 7.5$ mg a day or  $> 3$  months of therapy
  - Bisphosphonates for patients with low bone mass
  - rhPTH 1-34 may be the drug of choice for GC treated patients with osteoporosis

# Epidemiology of Stress Fractures

- Fatigue fractures: Military recruits, athletes, dancers, children associated with change in intensity or regularity
- Established risk factors: thin bones, low BMD, less physical fitness
- Fractures are present in areas of maximal stress-lower extremities, eg tibia, fibula, pelvic ring and feet

# Stress Fracture vs. Pathologic Fracture

- X-ray: endosteal thickening, benign
- Periosteal reaction
- CT-endosteal thickening, benign periosteal reaction
- MRI-linear to bandlike abnormality, edema on T2,
- Bone scan or PET-focal or linear abnormality
- X-ray and CT Aggressive bone marrow pattern of destruction, mineralized matrix, endosteal scalloping, aggressive periosteal reaction, soft tissue mass
- MRI-Well defined T1 bone marrow abnormality, endosteal scalloping
- Bone Scan or PET- diffuse uptake,

# Typical locations of Stress Fractures by activity

- Ulna-coronoid-pitching
- Humerous-distal diaphyses-throwing
- Ribs- carrying heavy objects, gold
- Lower cervical spine-clay shoveling
- Obturator ring-bowling, gymnastics
- Femur diaphyses and neck-ballet, running
- Fibula, tibia-running and jumping
- Calcaneus-jumping
- Tarsal navicular-marching, running
- Metatarsal diaphyses-marching