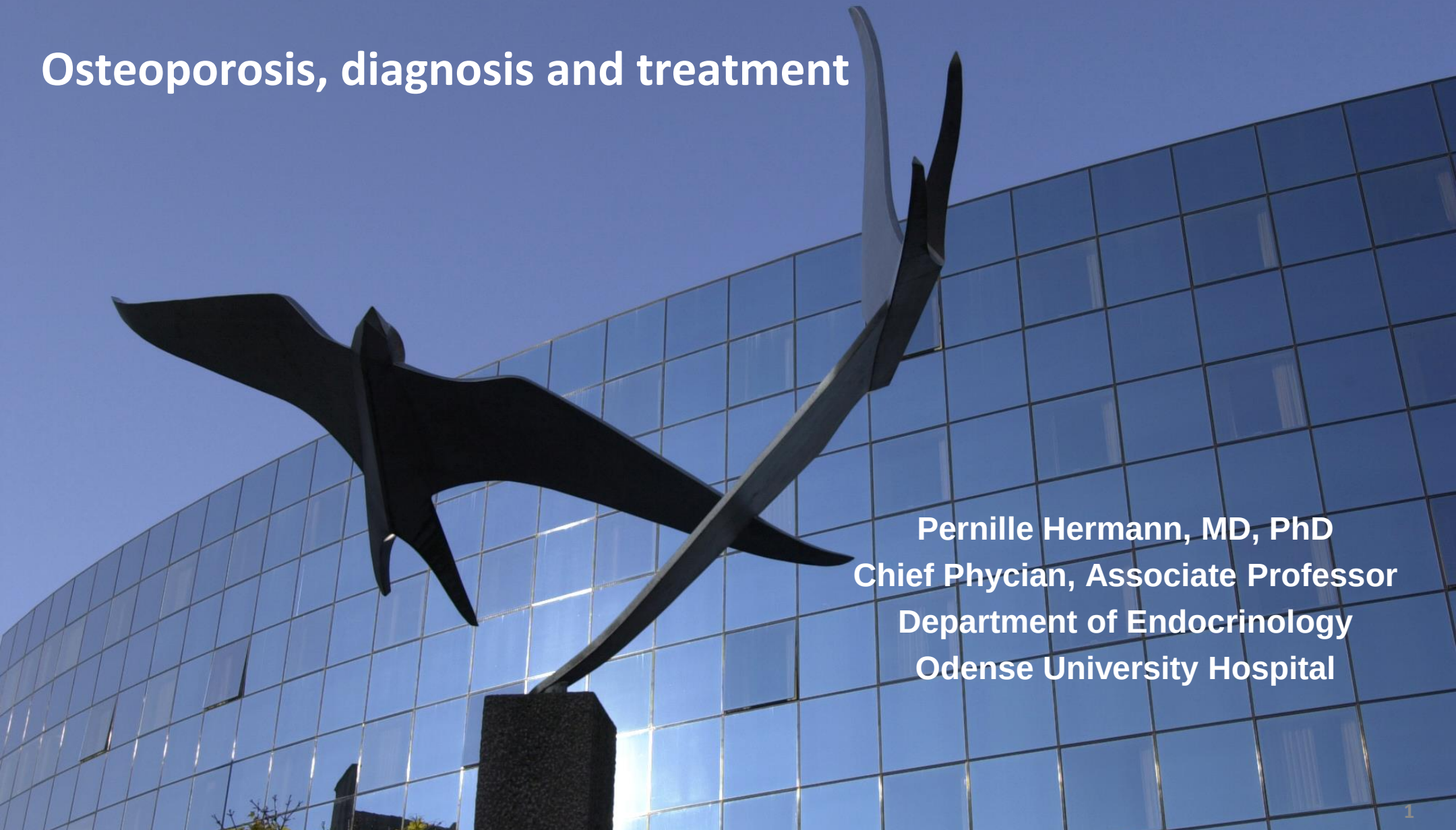
Osteoporosis, diagnosis and treatment



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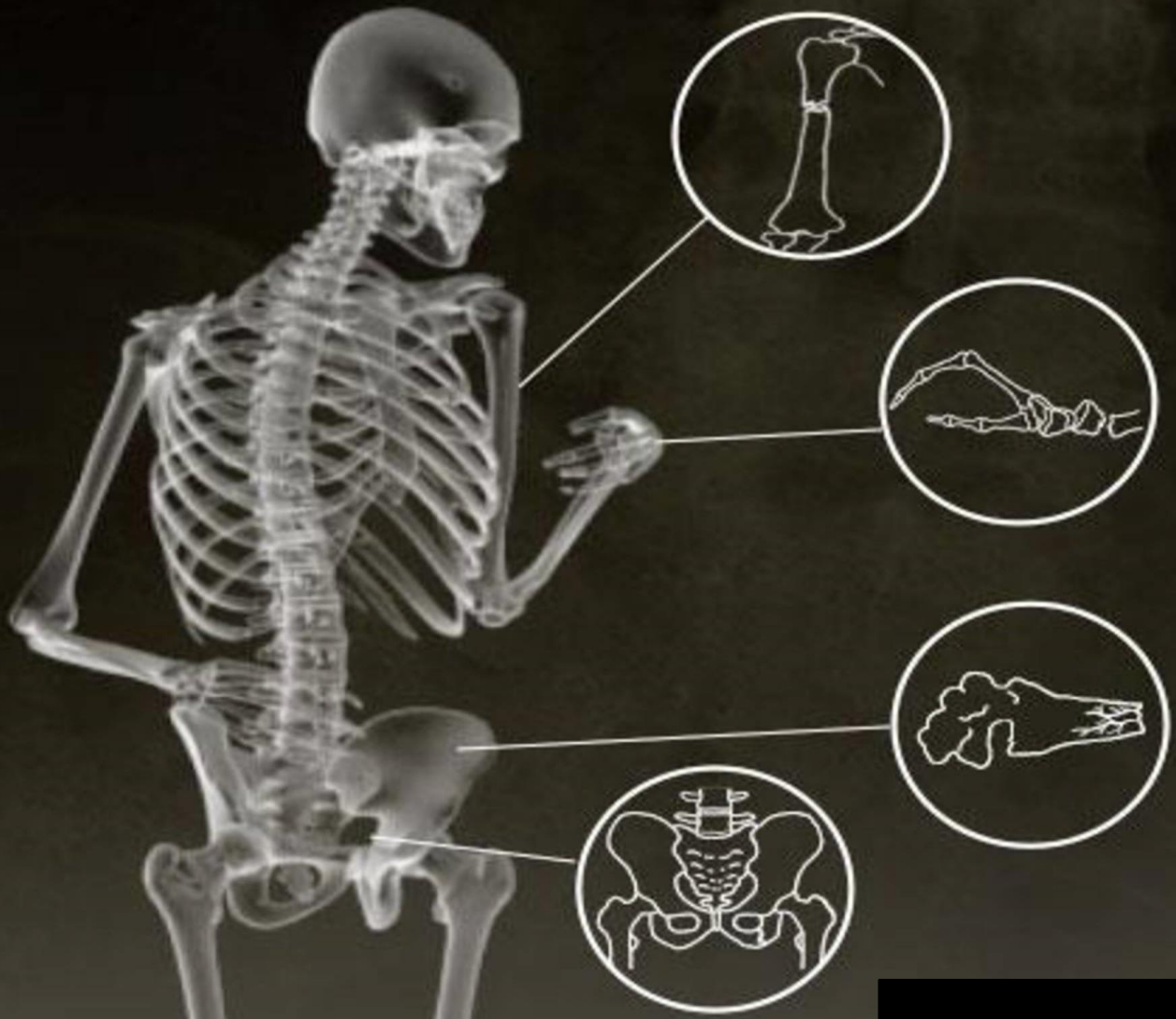
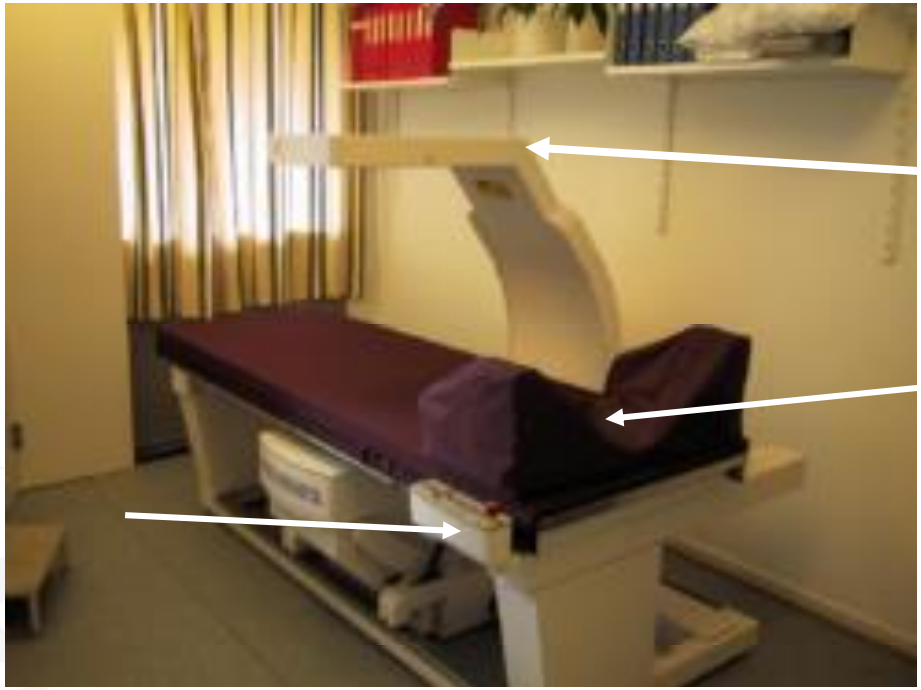
Fractures are the main (/only) features of osteoporosis



- Fracture site[1]
  - Spine
  - Wrist
  - Hip
  - Pelvis
  - Humerus

DXA-scan



Detection

Moveable bed

X-ray

Diagnosing osteoporosis

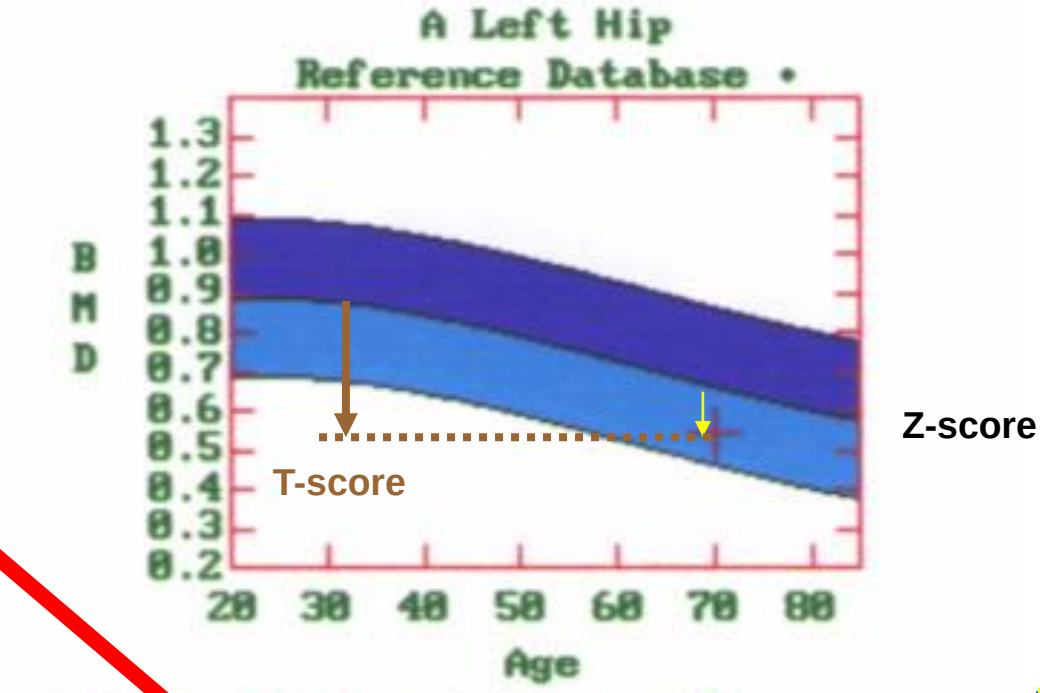
Vertebral fracture without relevant trauma

or

BMD T-score < -2.5 in at least one central region (hip or spine)

After excluding conditions with temporary (reversible) bone loss

T< -2.5 altså osteoporose



"Normal" for alder

BMD(Neck[L]) = 0.543 g/cm^2

Region	BMD	T	Z
Neck	0.543	-3.52 61% (22.0)	-1.24 [illegible]
Troch	0.561	-1.79 78% (30.0)	[illegible] 97%
Inter	0.766	-2.72 67% (29.0)	-1.11 83%
TOTAL	0.664	-2.59 68% (28.0)	-0.93 86%
Ward's	0.420	-3.42 53% (28.0)	-0.29 93%

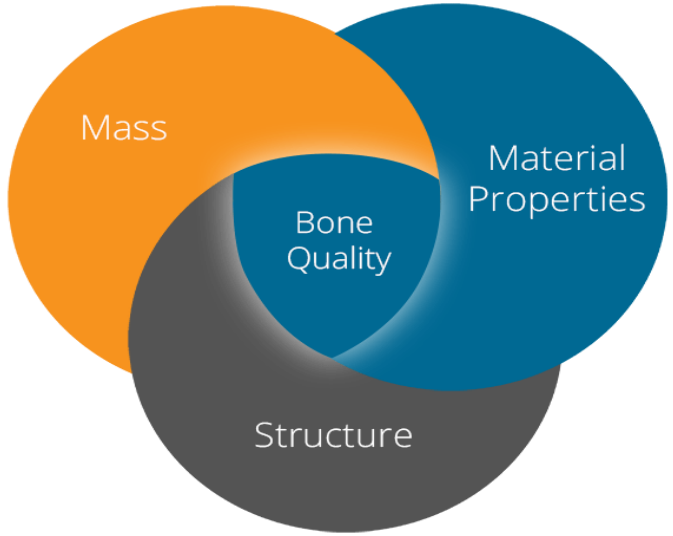
Total

DXA limitation

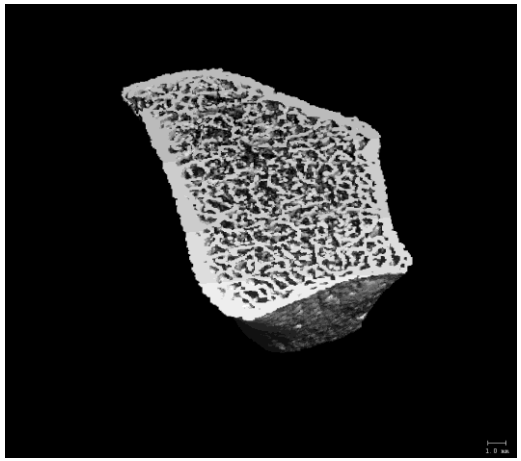
DXA measures Bone Mineral Density

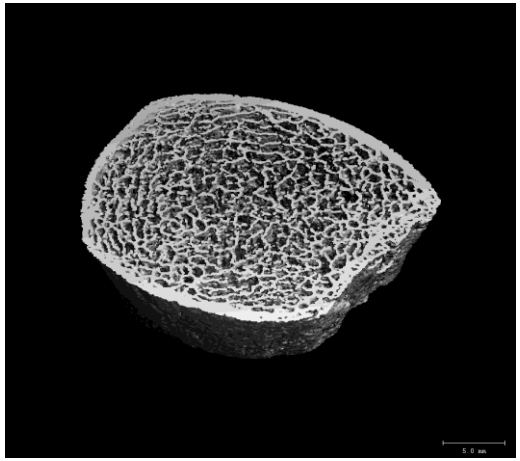
Bone strength is determined by

- Bone mineral density
- **Bone structure**
- **Bone material property**



Bone structure
High Resolution peripheral qCT

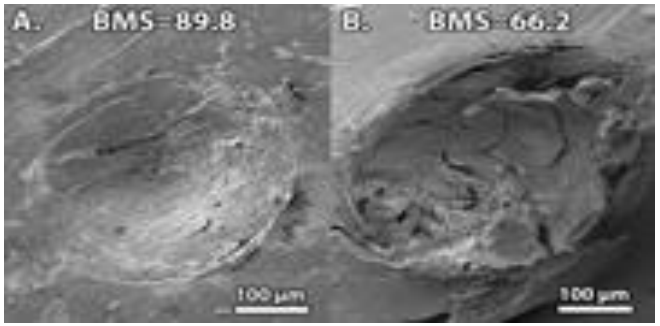




Virtual Radius/Tibia Bone Biopsy

- **Bone Geometry**
- **Volumetric Bone Mineral density**
- **Cortical and trabecular Micro-architecture**

Bone Material Property



Treatment options for osteoporosis
Anabolic therapy

- Teriparatatide (daily sc injection)
  - Increases bone mineral density by increasing both bone formation and – but with a time delay
  - Reduces vertebral fracture risk by 75%
  - Treatment for 2 years followed by antiresorptive therapy

- Romozosumab (sclerostin antibody) (Monthly sc injection)
  - Increases bone formation and decreases bone resorption
  - Reduces vertebral fracture risk by 75%
  - Treatment for 1 year followed by antiresorptive treatment

Still investigational !!!!

Treatment options for osteoporosis
Antiresorptive therapy

Bisphosphonates (weekly tablet, yearly infusion)

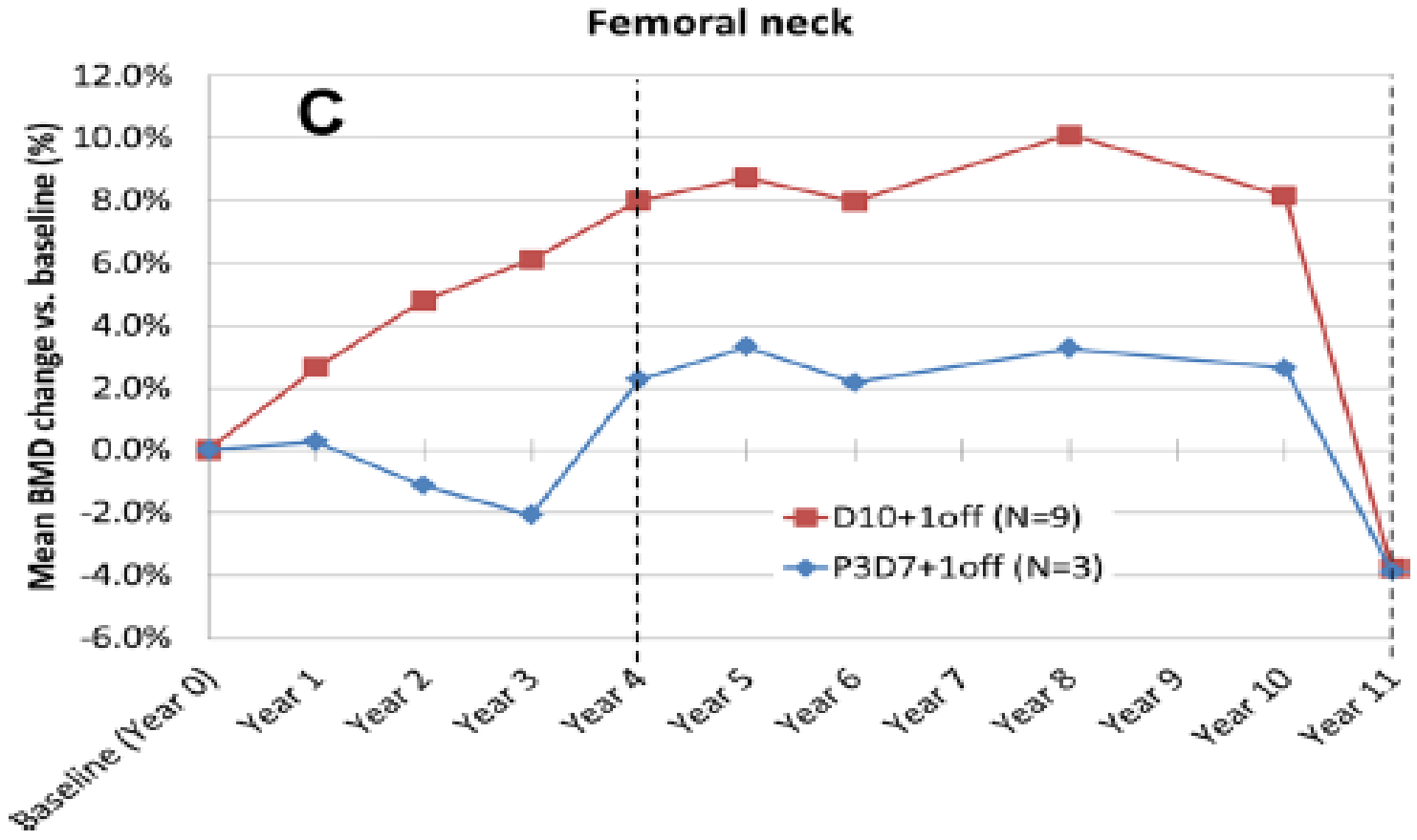
- Deposited in bone
- Kills osteoclasts
- Reduces fracture rate by 50%

Denosumab (6 monthly sc injection)

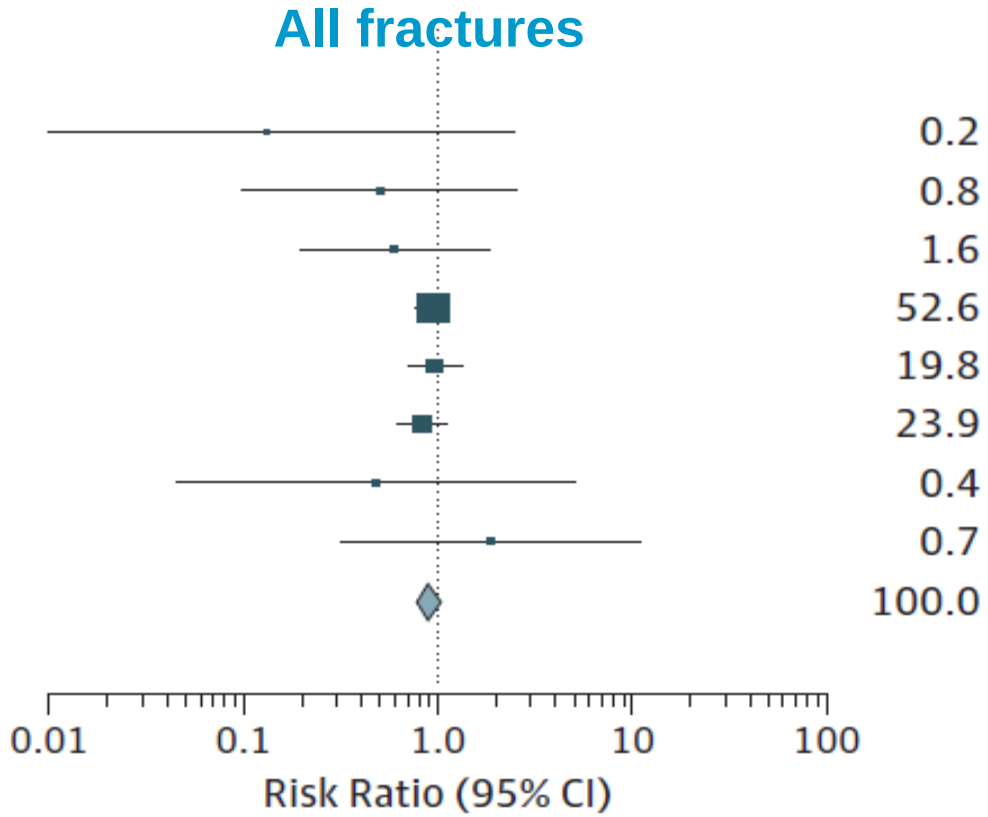
- No bone deposition
- Very potent inhibitor of osteoclasts
- Very strong rebound effect

Stopping treatment

Denusomab



Calcium and Vitamin D supplementation Meta-analysis



Zhao et al 2017

Danish recommandations

Patients with osteoporosis or at increased risk

(incl persons > 70 years)

- 1200 mg calcium from food or supplements
- 20 µg vitamin D

Surrogate measures in osteoporosis

- The hard endpoint for assessing osteoporosis interventions is fracture prevention
- BMD is a socalled surrogate measure
- Pharmacological treatment for osteoporosis will not be approved without fracture data
- Termination of antiresorptive therapy without bone deposition may cause troubles

Antiresorptive therapies without (untill now) fracture data

Examples

Re'cap

Osteoporosis is diagnosed based on

- Prevalent vertebral fractures or low BMD (T-score < -2.5)

New options are being investigated, but longterm observation is needed

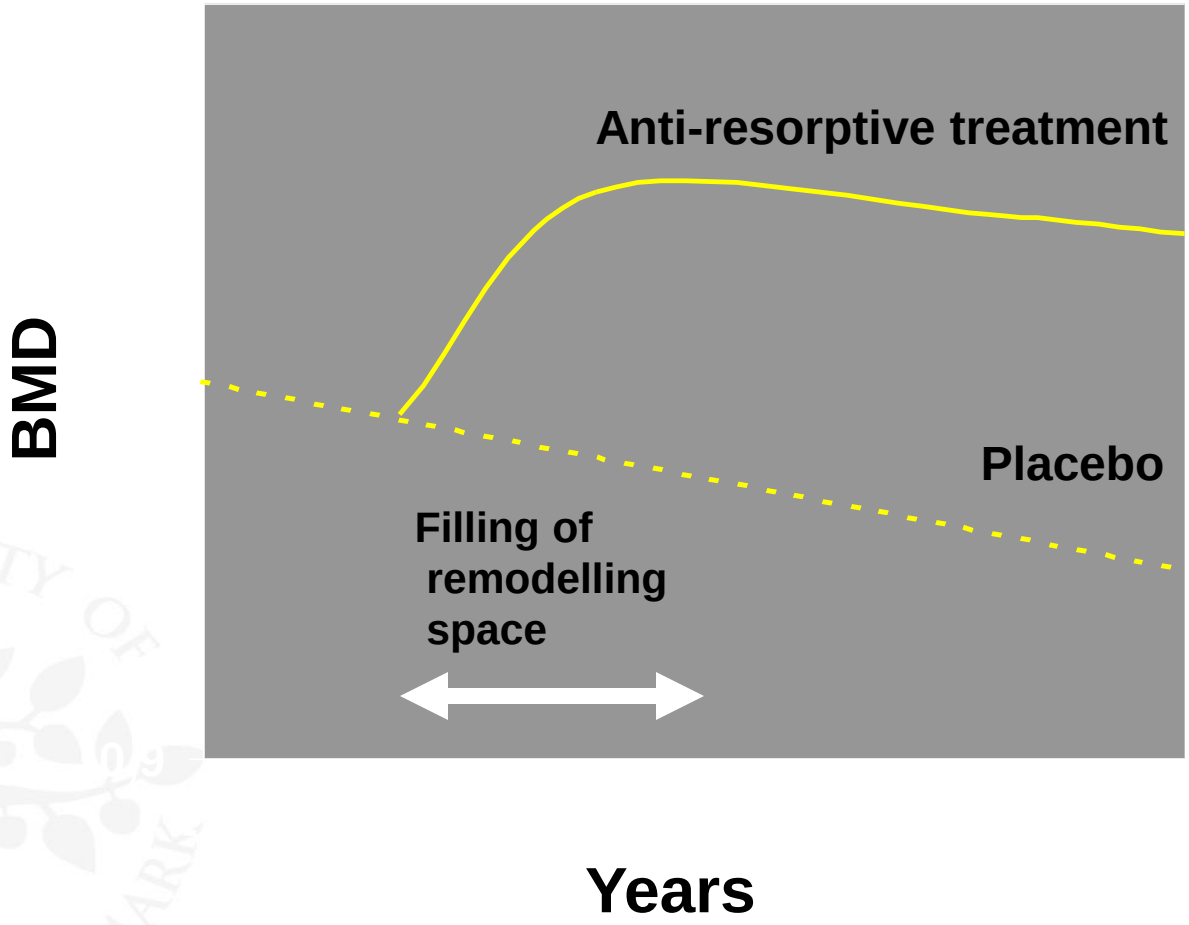
Untill now fracture data are required to get approval as an intervention for osteoporosis

- Future ?

Drug development is focused on anabolic therapies

Calcium and vitamin D are not treatment options for osteoporosis but low calcium intake and low vitamin D status are risk factors for fractures

Effect of anti-resorptive treatment on BMD



Modified from Parfitt Miner Electrolyte Metab 1980;4:273