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PREFACE

The third edition of Physical Medicine and Rehabilitation Pocketpedia expands upon the first two editions, with new evidence-based data and updated references on topics relevant to the field of physical medicine and rehabilitation. New chapters covering topics of increasing importance in the field have been incorporated, including Quality Improvement, Cancer Rehabilitation, Acupuncture, and Ultrasound.

We hope that this new edition will continue to provide readers with a concise, handy, and up-to-date reference for ongoing education and clinical practice in our field.

Matthew Shatzer, DO
Howard Choi, MD
Share
Physical Medicine and Rehabilitation
Pocketpedia, Third Edition
OSTEOPOROSIS

Osteoporosis (OP) is a systemic skeletal disease characterized by low bone mass, caused by an imbalance between bone resorption and bone formation. Peak bone mass is reached between 30 and 35 years of age, after which bone remodeling leads to bone loss. The imbalance between resorption and formation causes microarchitectural deterioration of bone tissue, increasing bone fragility. Risk factors for OP include age >50 years, female gender, Caucasian race, positive family history, excessive thinness, sedentary lifestyle, immobility (e.g., spinal cord injury), excessive alcohol use, smoking, history of prior fractures, calcium deficiency, decreased estrogen, hyperthyroidism, diabetes, anticonvulsant use, and glucocorticoid use (generally for at least 3 months; 1–3).

Bone mineral density (BMD), measured using dual-energy x-ray absorptiometry (DXA) scan, is a well-established predictor of future fracture risk. BMD is reported using T-scores and Z-scores, which are expressed in standard deviations from the means of reference populations. T-scores use a reference population of young, healthy adults matched for gender. Z-scores use age-, gender-, and ethnicity-matched reference populations. WHO BMD criteria (which use T-scores at the lumbar spine and femoral neck) are recommended for diagnosis of OP in postmenopausal women and men aged ≥50 years (2,3), see Table 23.1.

Besides BMD testing, diagnosis of OP can also be made clinically by history of hip or vertebral fracture during adulthood in the absence of major trauma such as a motor vehicle accident or multi-story fall (2,3). WHO BMD criteria should not be used for diagnosing OP in children, premenopausal women, or men aged <50 years. In these groups, the diagnosis of OP should not generally be made by BMD criteria alone, and only Z-scores should be reported, not t-scores (2,3). A Z-score greater than -2.0 is interpreted as within the expected range for age, and a Z-score of -2.0 or below is interpreted as below the expected range for age. Low Z-scores typically alert clinicians to the presence of secondary OP.

<table>
<thead>
<tr>
<th>WHO Criteria for Diagnosis of OP</th>
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<tbody>
<tr>
<td><strong>Normal BMD</strong></td>
<td>T-score -1 or greater</td>
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<tr>
<td><strong>Osteopenia</strong></td>
<td>T-score between -1 and -2.5</td>
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<tr>
<td><strong>Osteoporosis</strong></td>
<td>T-score -2.5 or less</td>
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<td><strong>Severe osteoporosis</strong></td>
<td>T-score -2.5 or less, with fracture</td>
</tr>
</tbody>
</table>

BMD, bone mineral density.

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SCREENING

The National Osteoporosis Foundation (NOF) recommends BMD testing for all women aged ≥65 years and all men aged ≥70 years, regardless of clinical risk factors; as well as for postmenopausal women and men aged 50 to 69 years based on risk factor profile (2,3). Postmenopausal women and men aged ≥50 years who have had an adulthood fracture should also be tested to diagnose and determine the degree of OP (2,3).

SUPPLEMENTS AND PHARMACOTHERAPY

NOF treatment guidelines are recommended for use in all individuals with or at risk for OP, but are primarily directed for use in postmenopausal women and men >50 years of age. Per current NOF guidelines, men aged 50 to 70 years are advised to consume 1,000 mg/day of calcium. Women aged >50 years and men aged >70 years are advised to consume 1,200 mg/day of calcium. Intake of higher amounts of calcium has not been shown to confer additional benefit but may increase the risk of kidney stones, cardiovascular disease, and stroke (2,3). Adults aged >50 years are recommended to consume 800 to 1,000 IU/day of vitamin D (2,3).

Pharmacotherapy is recommended for use in postmenopausal women and men >50 years with any of the following: (a) t-score less than -2.5 at the femoral neck, total hip, or lumbar spine; (b) hip/vertebral fracture; (c) t-score between -1.0 and -2.5 at the femoral neck, hip, or spine, a 10-year probability of a hip fracture ≥3%, or a 10-year probability of a major OP-related fracture ≥20% (2,3).

Bisphosphonates such as alendronate and risedronate are considered first-line treatment for OP. These can increase the BMD 5% to 10% within the first 2 years of treatment (4), and vertebral fracture risk is reduced by 30% to 50% (5). Use of unopposed estrogen for the treatment of OP fell out of favor when the Women’s Health Initiative study found that hormone replacement therapy can increase the risk of cancer, stroke, and venous thromboembolism (4). The goal of selective estrogen receptor modulators (raloxifene) is to maximize the beneficial effect of estrogen on bone while minimizing the deleterious effects on breast and endometrium. Raloxifene has reduced vertebral fracture risk by 36% in large clinical trials (5). *Salmon calcitonin* (100 IU IM/SQ qd) improves BMD and reduces vertebral fracture risk at the lumbar spine, but not at the hip (6). Nasal calcitonin (200 IU qd) has similar benefits, but is not as effective in treating bone pain as the injectable (5). Denosumab (60 mg subcutaneous [SC] q 6 months) is a RANK ligand inhibitor that inhibits osteoclast development and thus mitigates bone resorption. Repeat BMD testing should be performed 1 to 2 years after starting any pharmacologic agent and every 2 years thereafter (2,3).
EXERCISE AND REHABILITATION

The NOF recommends an exercise prevention program, focusing on weight-bearing exercises for a total of 30 minutes 5 to 7 days per week and muscle strengthening 2 to 3 days per week (7). Interventions to reduce the risk and/or impact of falls (e.g., appropriate assistive mobility devices, exercise programs, hip padding, and avoidance of medications affecting the CNS) may reduce hip fracture incidence. Poor back extensor strength has been reported to correlate with a higher incidence of vertebral fractures (8).

Acute vertebral fractures can be painful and are often managed with bed rest, orthotic immobilization, and analgesics (e.g., narcotics). NSAIDs should be used with caution. Rigid orthoses to limit spinal flexion (e.g., cruciform anterior spinal hyperextension [CASH] and Jewett) may reduce the risk of additional vertebral body fractures. Postural training, back extensor exercises, pectoral stretching, walking, or other weight-bearing exercises are the mainstays of rehabilitation.

Percutaneous vertebral augmentation interventions (i.e., vertebroplasty and balloon kyphoplasty) are minimally invasive and have been shown in case series to provide excellent short-term analgesic relief, although long-term benefits with respect to pain or function have only rarely been noted (9). These interventions, which involve the injection of polymethyl methacrylate to provide a rigid vertebral reinforcement, may increase the risk of new vertebral fractures, particularly at adjacent vertebrae (9). Absolute contraindications include discitis, osteomyelitis, and sepsis. Relative contraindications include significant spinal canal compromise due to bone fragments, fractures older than 2 years, >75% collapse of the vertebral body, fractures above T5, and traumatic compression fractures or disruption of the posterior vertebral body wall. In clinical practice, many physicians limit the use of these procedures to fractures that are less than 6 months old. Spine surgery is reserved for rare cases involving neurologic deficits or an unstable spine.

REFERENCES


**SUGGESTED READING**
